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UNITED STATES DEPARTMENT OF COMMERCE
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WEATHER BUREAU — F. W. Reichelderfer, *Chief*

MONTHLY WEATHER REVIEW

JULY 1943

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CORRECTIONS

MONTHLY WEATHER REVIEW, September 1942, vol. 70; the serial number on both the front cover and the title page should be "1378" (not "1375").

April 1943, vol. 71: Page 56, crest stage at Lock No. 19, Tuscaloosa, Ala., 49.8 feet on April 20, should be 49.2 feet on April 19; data omitted for Lock No. 3, Whitfield, Ala., elevation: flood stage, 33 feet; crest stage, 37.9 feet.

June 1943, vol. 71: Page 101, 1st column, 10th entry from bottom of page, Beloit, Kans., crest "24.7ft", June 15, should be "24.8"; Niles, Kans., crest "27.9", June 17 should be "27.8", and "25.6" on June 23; same page, second column, Garden, Kans., crest "4.04" should be "19.8"; Waverly, Kans., crest "20.0", June 17, should be "17.5", and "21.85" on June 17; Topeka, Kans., crest "26.2", June 11, and "26.75", June 17, should be "26.3" and "26.8", respectively; pages 109 and 110, table "Severe Local Storms," the subheading of the second column should be "June", not "May," as printed.

MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 71, No. 7
W. B. No. 1392

JULY 1943

CLOSED SEPTEMBER 4, 1943
ISSUED OCTOBER 5, 1943

SEMIMONTHLY DISTRIBUTION OF HAIL IN THE UNITED STATES [1]

By HOYT LEMONS

[State College of Washington, Pullman, Wash., February 1943]

Additional details on the pattern of hail distribution and frequency in the United States are illustrated by 24 semimonthly maps (figs. *1* to *24*). Other phases of the general subject of hail distribution and significance have been treated elsewhere.[2] [3] [4]

REGIONAL PATTERNS OF DISTRIBUTION

Two particular aspects of the Nation-wide hail pattern are noteworthy at the outset: (1) The pattern undergoes change constantly; (2) it is composed of three principal subphases, each with somewhat independent actions. The three regions containing the subphases are, roughly: (1) the interior, extending from the Ohio Valley to the basin and range country; (2) the east and southeast from the Ohio Valley to the Gulf and Atlantic coasts; (3) the Pacific area from the coast to the basin and range area.

In the interior region the warm season is accompanied by northward development and spread of hail activity; southward recession and diminution occur during the cool period. The norhward movement originates in the southern Great Plains in early February, spreading northward and eastward until late April (figs. 3–8), thereafter movement is northwestward over the Plains and northern Rockies until late June (figs. 9–12). Abatement of intensity follows (figs. 13–18), which, after mid-September, constitutes a southward recession. A hail-free area originates in Montana in early October (fig. 19). Wedge-like, it develops southward, meanwhile broadening east-westward in the north (figs. 20–24). By early January a hail-free corridor exists from the Canadian to the Mexican boundaries (fig. 1). This remains until the origin of the northward movement in February (figs. 1–2).

The Eastern region has light hail throughout, from mid-March until mid-June (figs. 6–12); thereafter, follows a slackening of hail, especially in coastal areas. A hail-free area appears to spread eastward and northward from the Texas coast, so that most of the inland sections are also hail-free by October (figs. 13–24). The chief exceptions are minor rugged areas. In early January light hail occurs in the south and gradually spreads (figs. 1–5). It should be emphasized that this cool season hail is chiefly a phenomenon of local turbulence.

In the Pacific area, hail is distinctly a cool season phenomenon,[5] summers being hail-free. Even in winter, however, the frequency of actual hail is low. Due to the source of data used, the accompanying maps overemphasize the importance of real hail in this area.[6]

Two movements are conspicuous during the cool season: (1) Southward spread and intensification of activity from early September to mid-January (figs. 17–24, 2;) much of the coastal areas proper experience mean semimonthly frequencies of 0.5–1.0 storms at this time. (2) Northward recession and diminution of activity during the latter part of the cool period, from early February to late May (figs. 3–10). From early June to late July, the hail-free area of the Pacific region extends eastward along much of the southwestern and southern borders of the country (figs. 11–14).

THE HAIL MAPS

The accompanying maps are presented as portraying the general pattern of hail occurrences for the country. Data for their construction were procured from all first-order Weather Bureau stations which keep such records. Their distribution is indicated in fig. 25. The occurrence of hail at these stations is assumed to be representative of that in their surrounding territories. Although all available records were utilized, the concentration of stations in the East and Midwest makes for more accurate portrayal of conditions there than in the far West. Due to the extremely local nature of individual hailstorms and to the relative fewness of observing stations, it is impossible to make an actual micro-climatological study of this nature over the vast extent of continental United States. Angot of the French Meteorological Service has estimated that it would be necessary to have a statiou for every 4 square miles if accurate, detailed observations were to be secured. An indirect approach for local studies, might utilize hail insurance damage statistics.

HOURLY DISTRIBUTION OF DAMAGING HAILSTORMS

Although damaging hailstorms may occur at any time in the 24-hour interval, maximum frequency is obtained in the late afternoon, at 5:30 o'clock, being built up after a minimum in the early morning hours (fig. 27). During the 14-year period, 1926–39, one-third of all damaging hailstorms which were recorded came during the interval between 4 and 6 p. m.; two-thirds occurred between 1 and 7 p. m. that is, within in the afternoon quarter of the day.

PATHS OF DAMAGING HAILSTORMS

The most common width of track of damaging hailstorms is 1 to 2 miles (fig. 26). Data on the paths of 2,105 hailstorms which occurred during the 14 year-period, 1926–39, were used. Approximately one-fourth of these storm tracks were 1 to 2 miles in width. Width varied considerably, however, ranging from a few yards to 75 miles.

[1] Paper included on the 1942 program of the Association of American Geographers.

[2] Lemons, Hoyt, "Hail as a Factor in the Regional Climatology of the United States," *Geographic Review*, July 1942. Maps and explanatory discussion of the annual, seasonal, and monthly patterns of hail distribution and frequency.

[3] Lemons, Hoyt, "Hail in High and Low Latitudes," *Bulletin of the American Meteorological Society*, February 1942. Explanatory discussion of hail occurrence in those areas where it constitutes less of a menace.

[4] Lemons, Hoyt, "Hail in American Agriculture," *Economic Geography*, October 1942. Discussion of the economic implications of hail to agriculture.

[5] According to observations of Weather Bureau officials and of the author in the region, much of the so-called hail is actually small hail. These small, white, opaque pellets are easily distinguishable from the larger, harder, concentric-layered hailstones. See also, Lemons, Hoyt, "Hail as a Factor in the Regional Climatology of the United States," *Geographical Review*, July 1942.

[6] Weather Bureau data, on which the maps are based, include small hail data along with those of hail.

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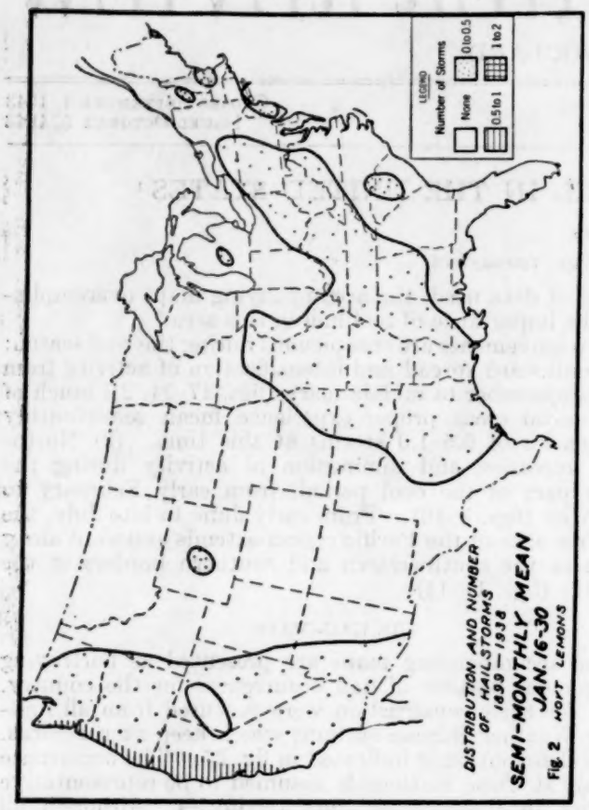


Fig. 2

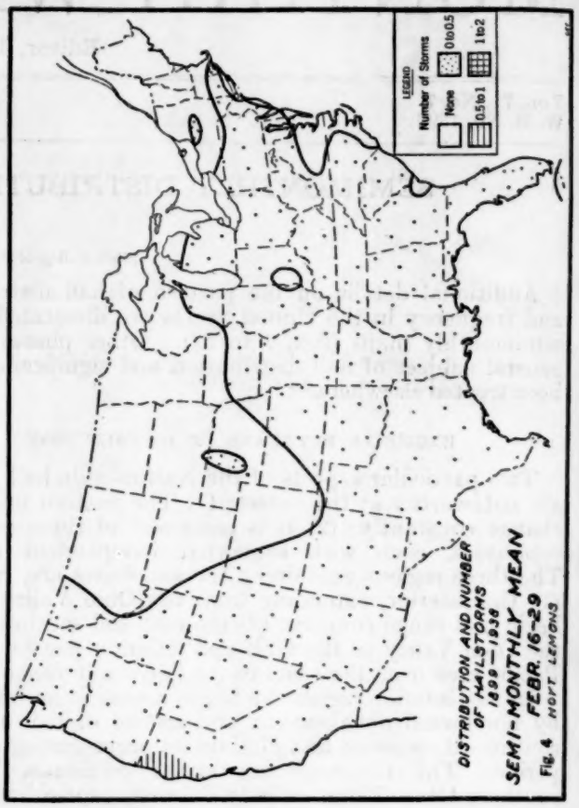


Fig. 4

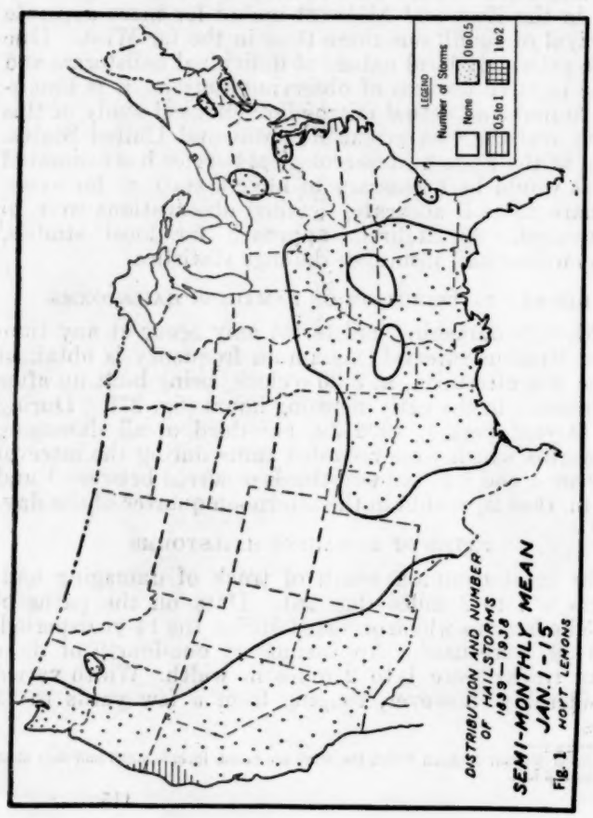


Fig. 1

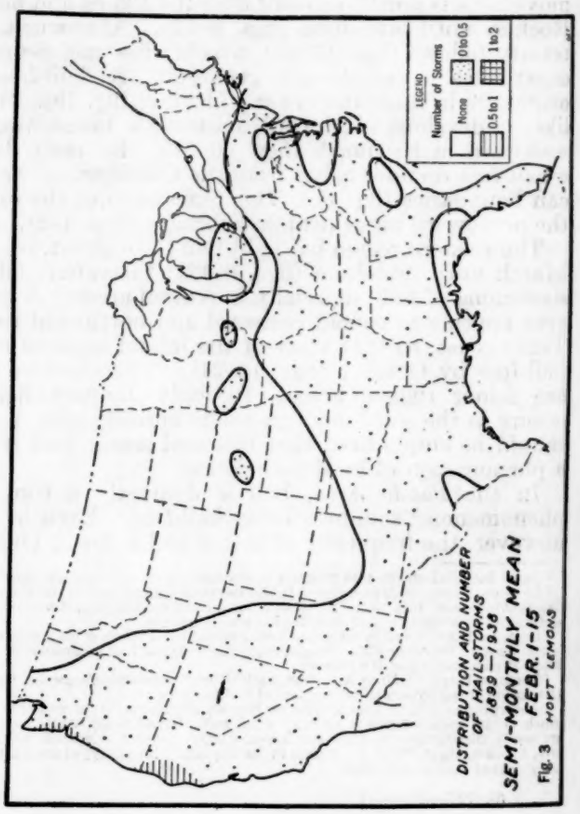


Fig. 3

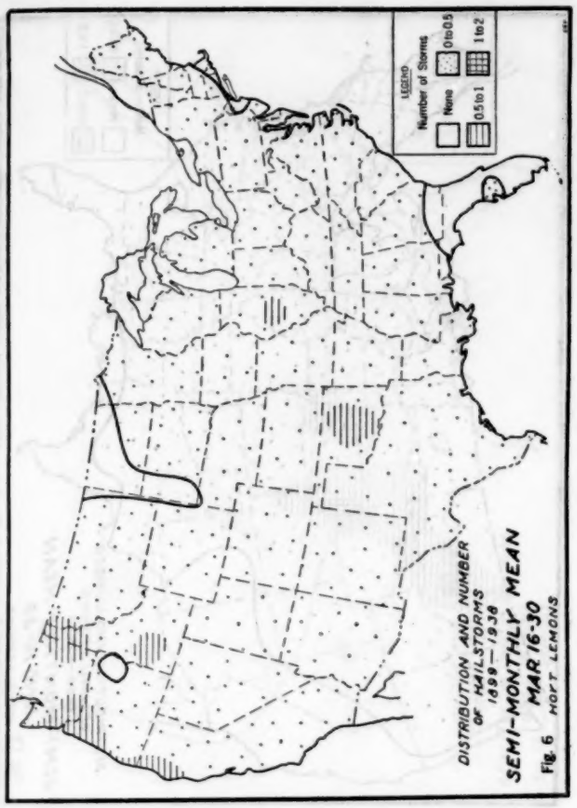


Fig. 6

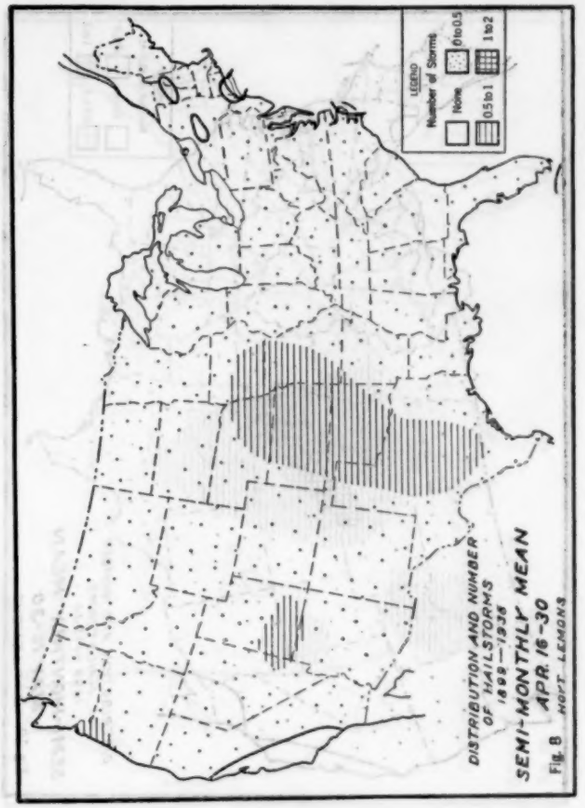


Fig. 8

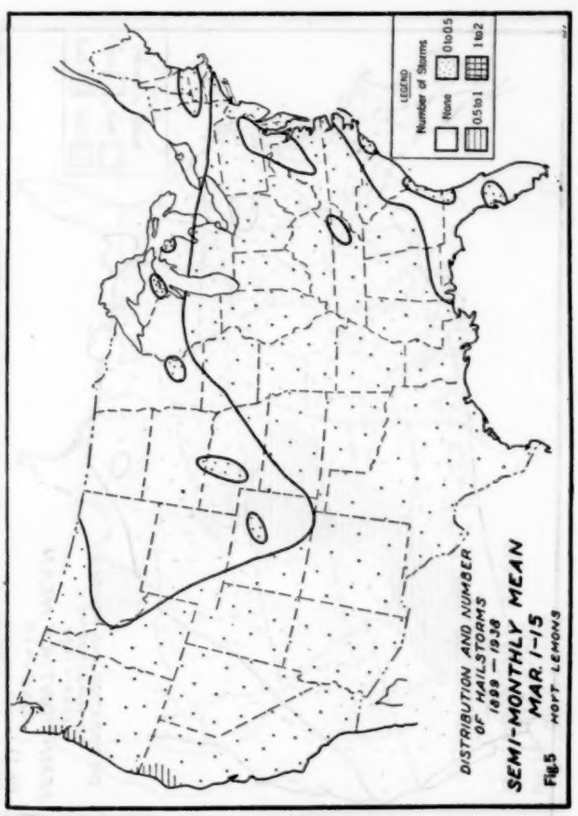
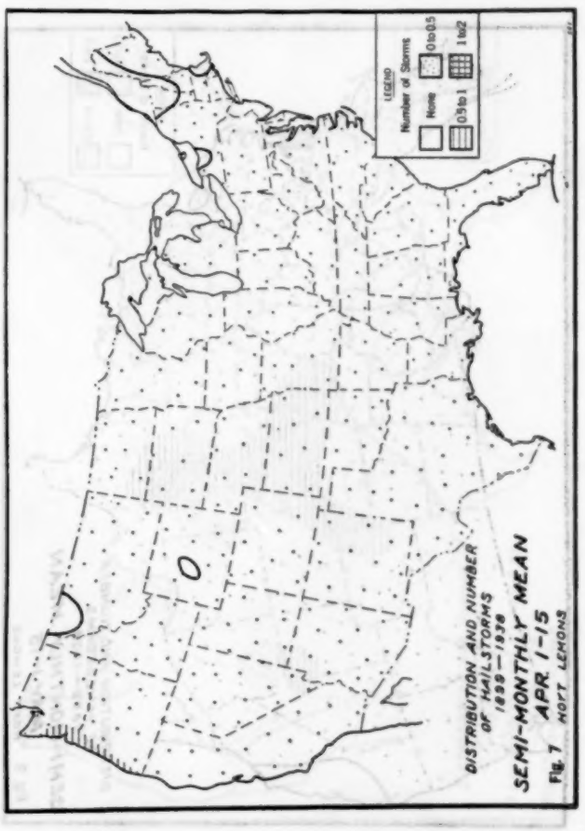


Fig. 5



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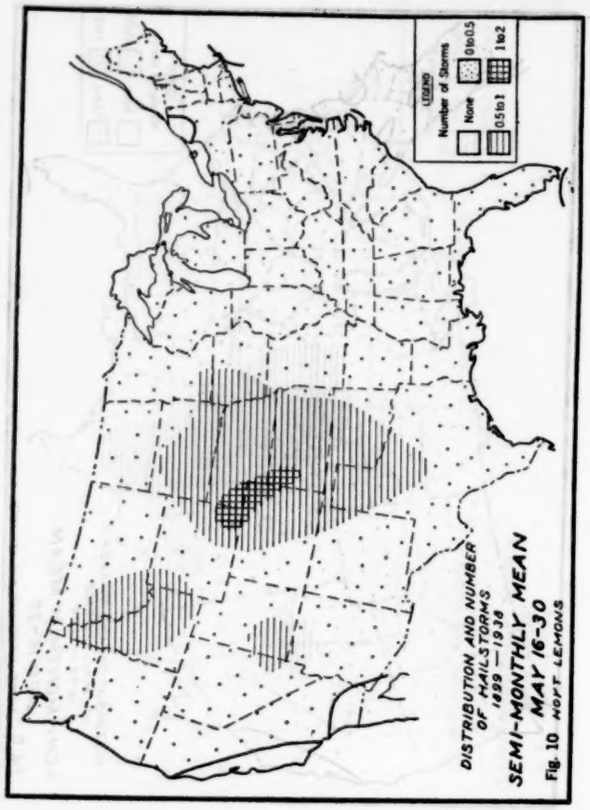
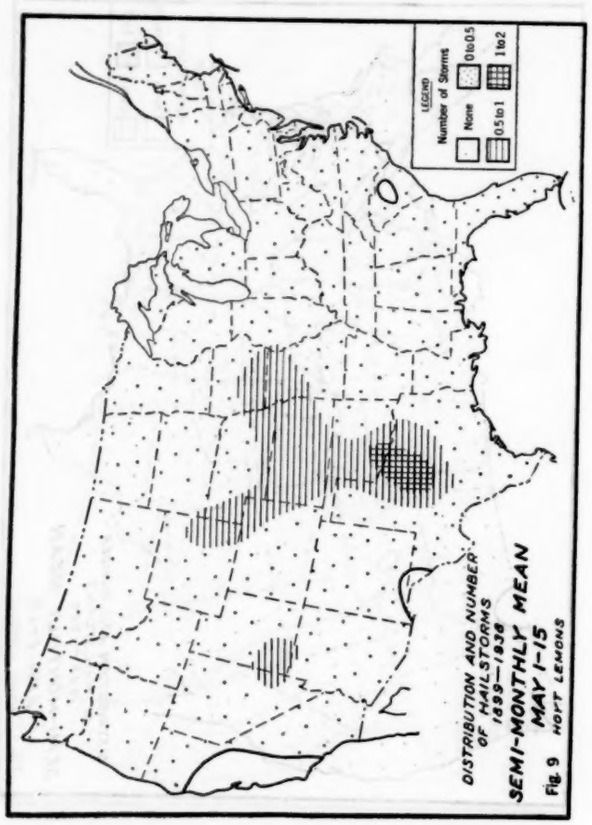


Fig. 10



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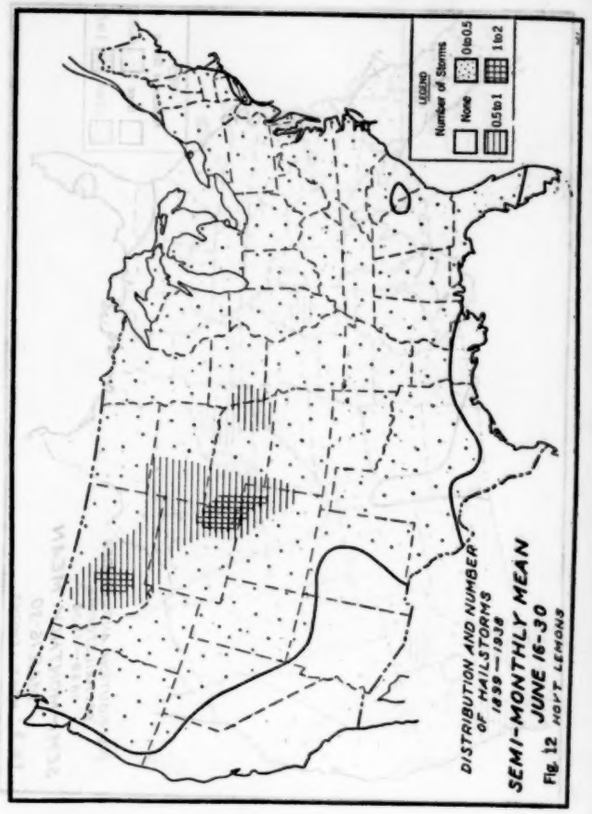

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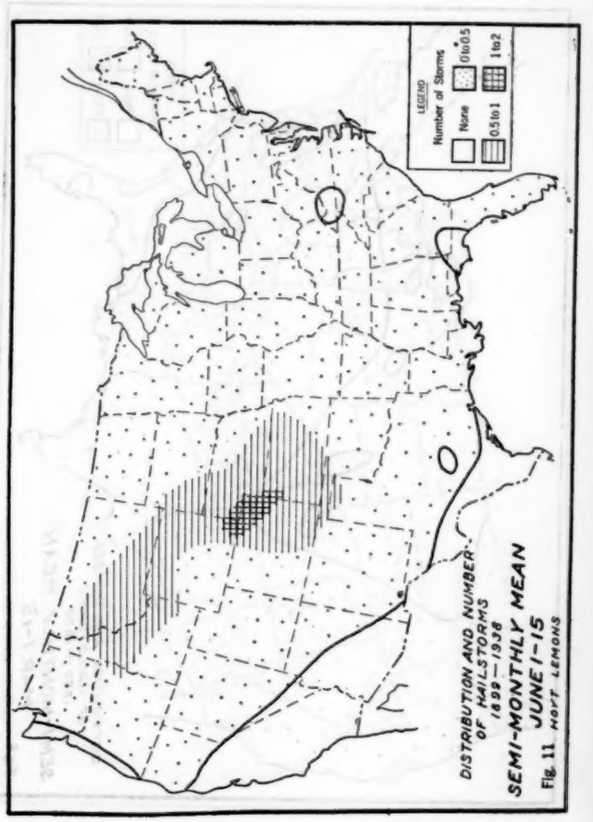

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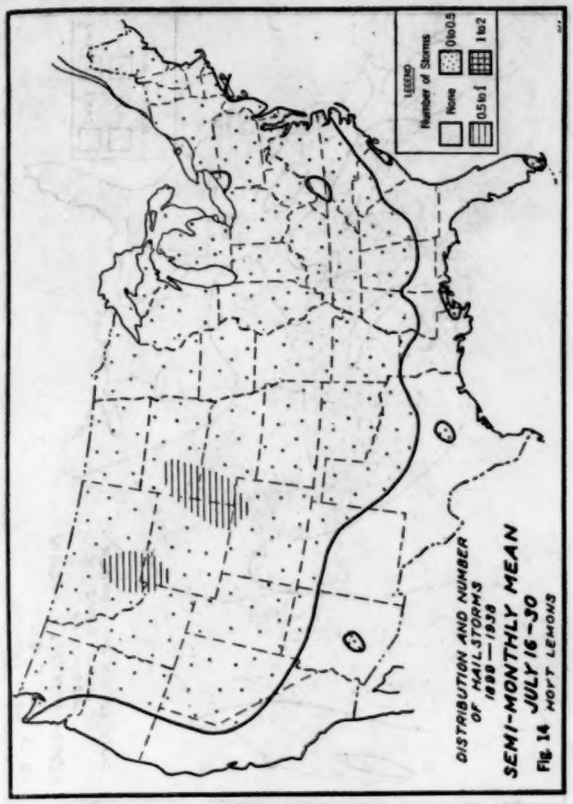

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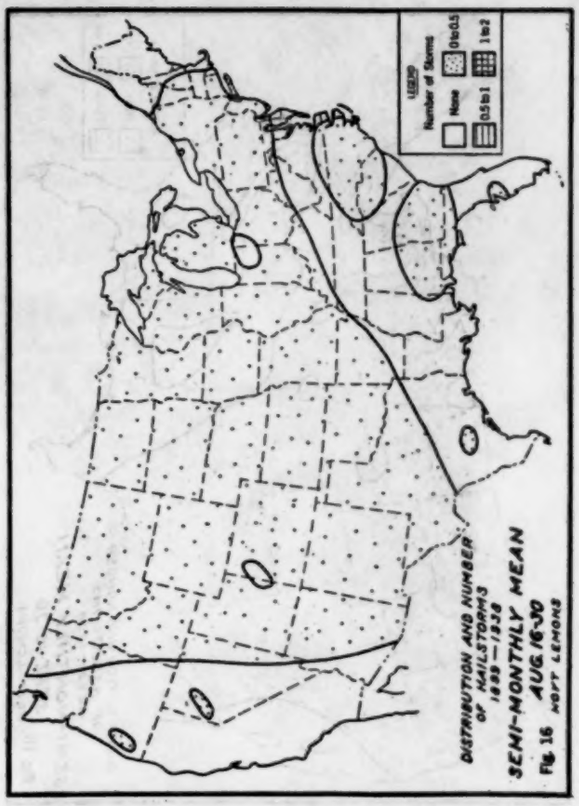

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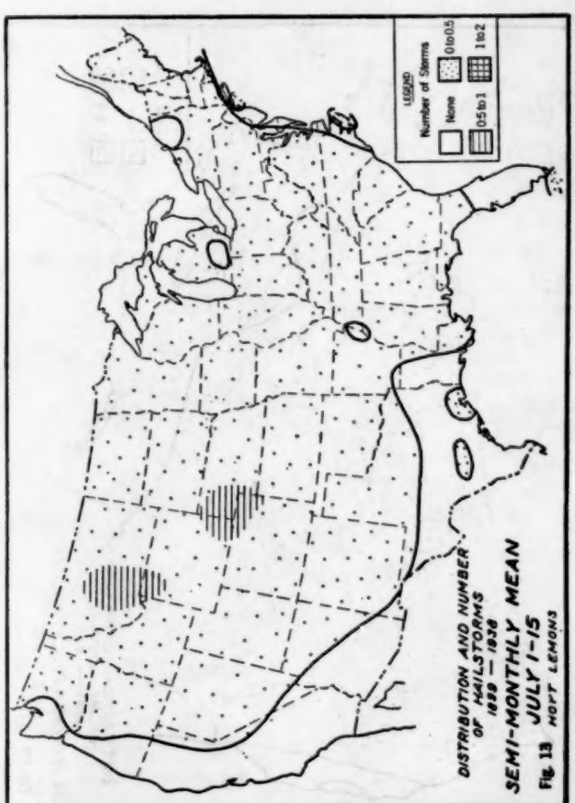


Fig. 13

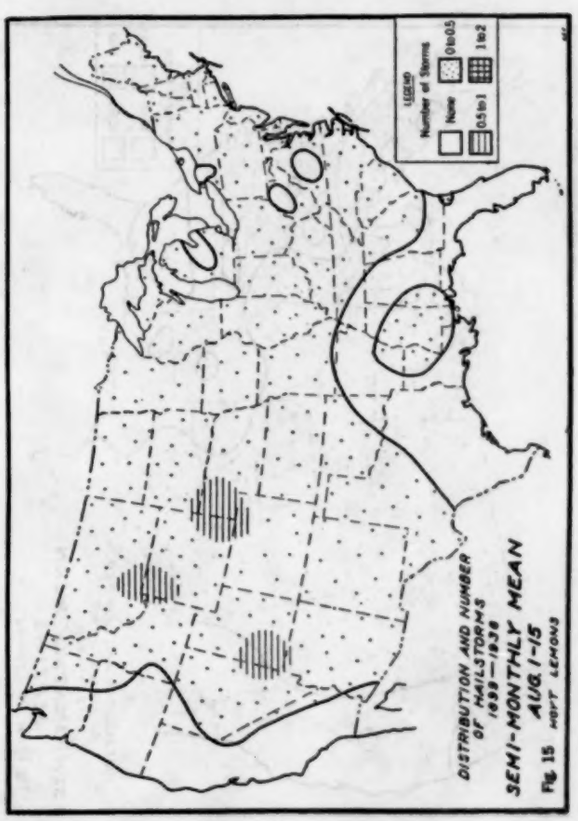


Fig. 15

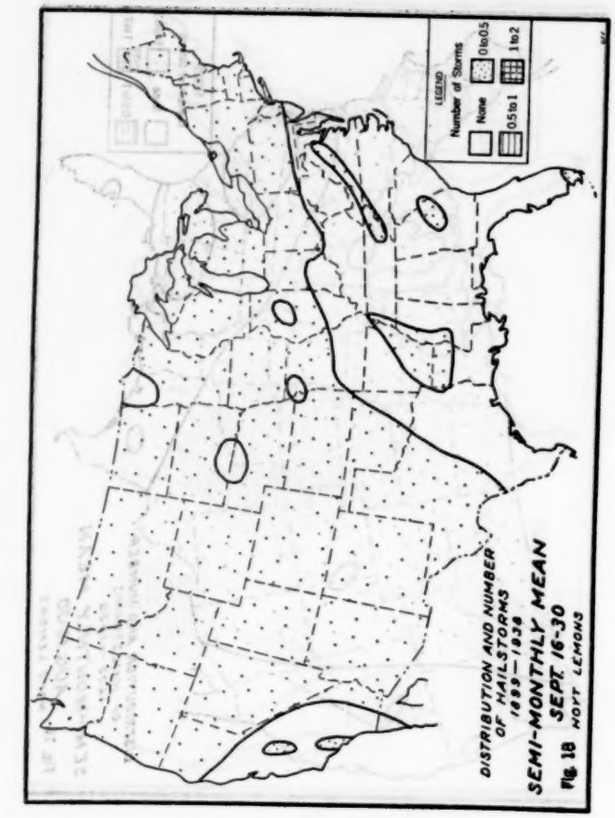


Fig. 18

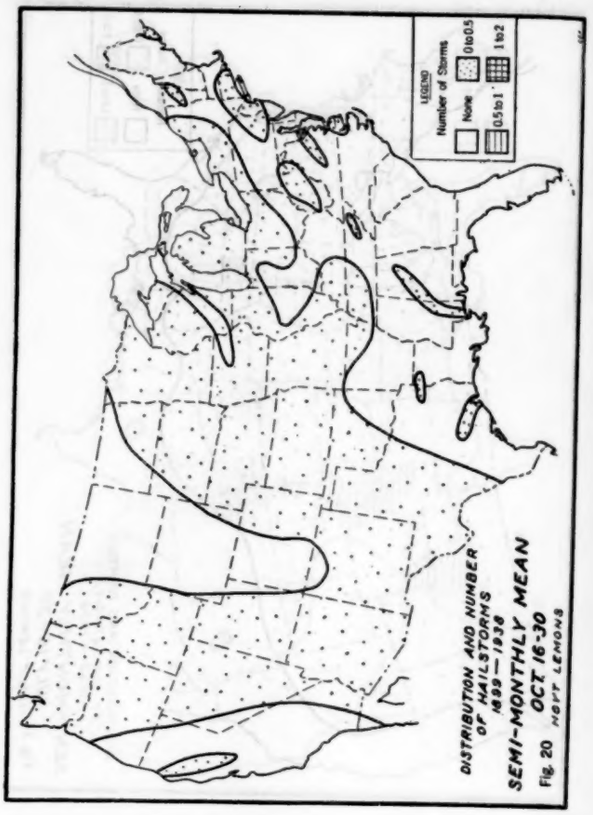
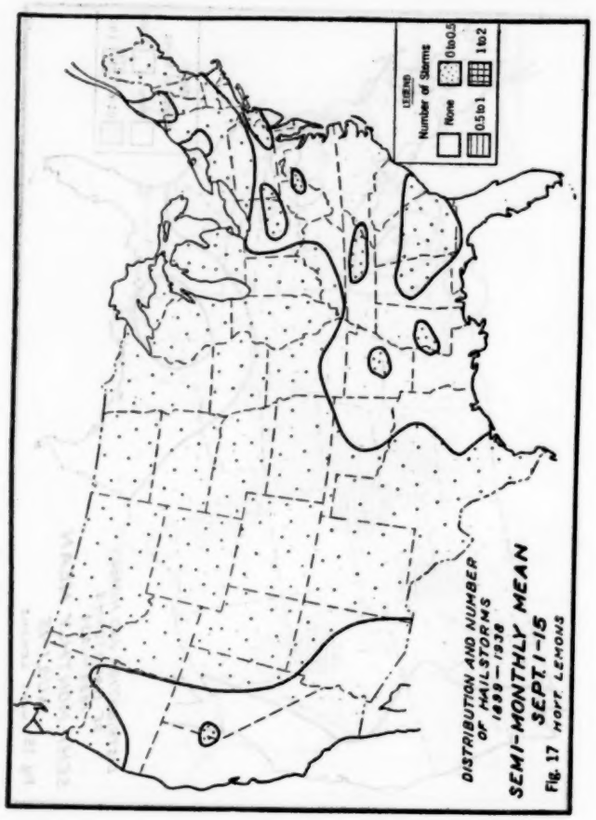


Fig. 20



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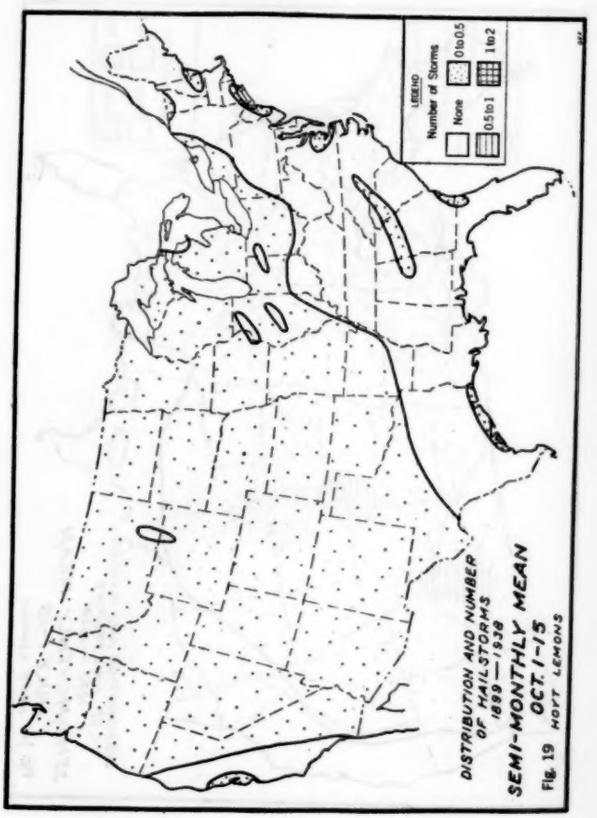


Fig. 19

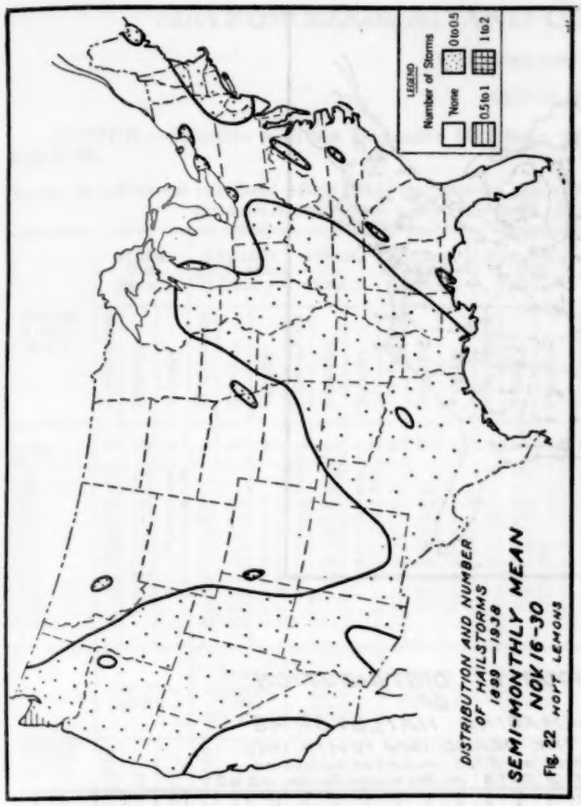


Fig. 22

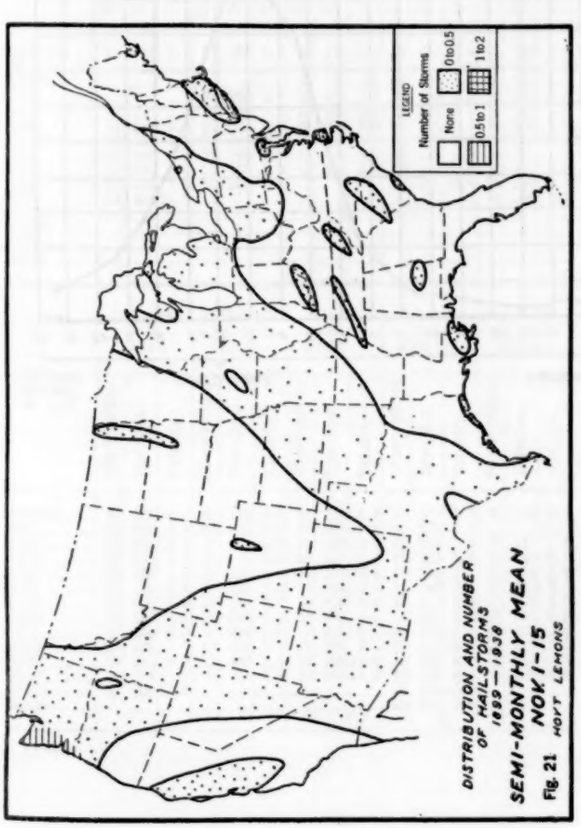


Fig. 21

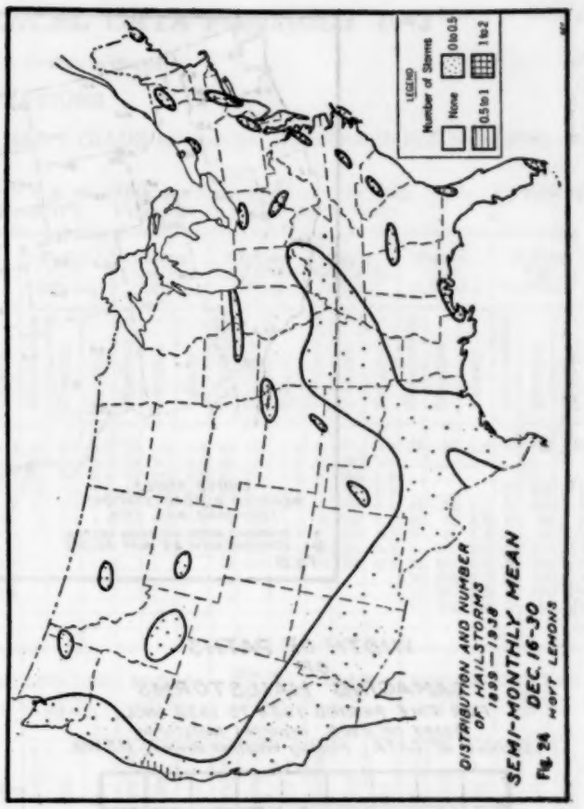


Fig. 24

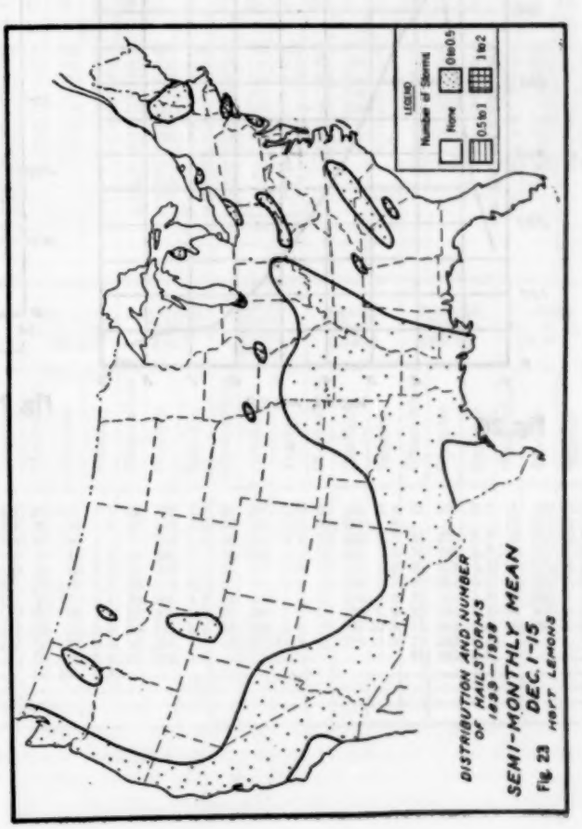


Fig. 23

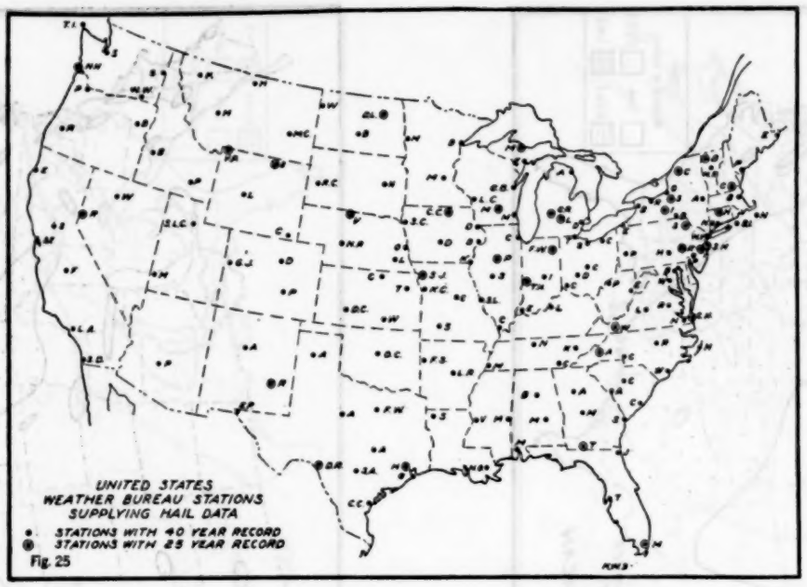


Fig. 25

WIDTH OF PATHS
OF
DAMAGING HAILSTORMS
FOR THE PERIOD 1924 TO 1939 INCL.
Based on 2105 reported hailstorms
SOURCE OF DATA: Monthly Weather Review, U.S.W.B.

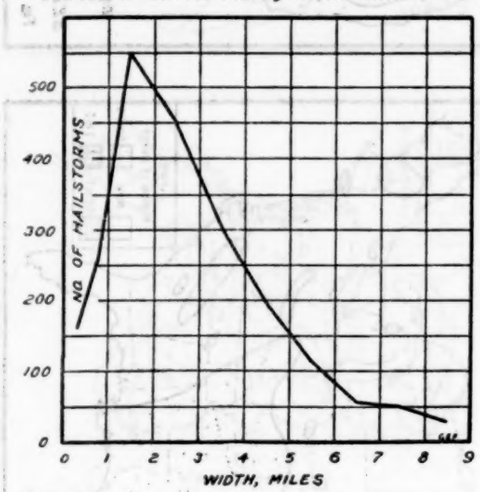


Fig. 26

HOURLY DISTRIDUTION
OF
DAMAGING HAILSTORMS
FOR THE PERIOD 1924 TO 1939 INCL.
Based on 2335 reported hailstorms
SOURCE OF DATA: Monthly Weather Review, U.S.W.B.

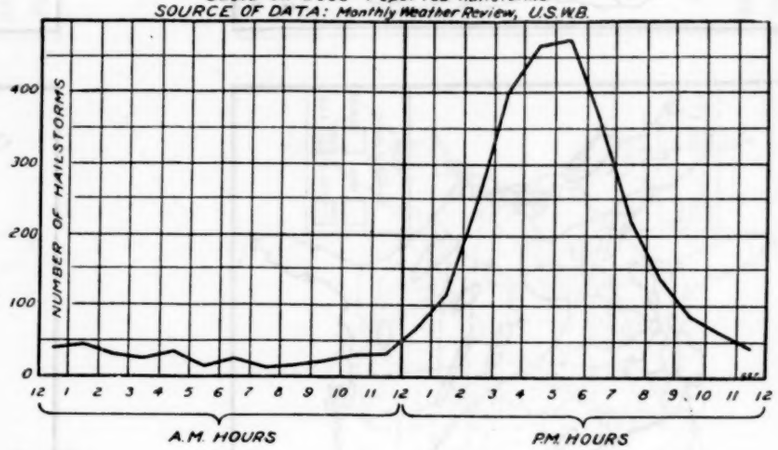


Fig. 27

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JULY 1943

[Climate and Crop Weather Division, J. B. KINCER, in charge]

AEROLOGICAL OBSERVATIONS

NOTICE.—Effective with the December 1942 issue, the publication of table 1 (RAOB summaries) was discontinued indefinitely.—EDITOR.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during July 1943. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (538 m.)			Albuquerque, N.Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (100 m.)			Charleston, S. C. (17 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)			El Paso, Tex. (1,196 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	149	2.8	31	234	2.2	28	277	1.5	31	237	1.1	31	243	1.0	31	318	4.8	31	141	7.3	31	227	2.9	30	264	0.8	29	200	1.8	31	(1)	0.0	31	29	1.6	31	154	2.5
500							28	264	2.1										31	151	8.1	31	250	3.2	30	247	2.0	29	201	4.1	31	226	1.2						
1,000	31	150	2.9				27	275	2.5				31	254	1.6	31	319	4.7	29	160	6.7	30	257	3.6	30	253	3.3	27	234	2.8	31	262	1.9						
1,500	31	148	2.7				27	290	2.8	31	249	1.2	31	260	2.9	31	315	2.8	28	157	3.8	30	270	4.0	29	266	5.1	24	274	2.4	31	276	3.2	31	157	2.1
2,000	30	135	2.4	31	223	2.4	25	304	3.8	31	280	1.5	28	248	4.6	31	302	2.0	24	145	2.3	27	275	4.4	25	274	6.4	23	298	2.1	29	289	4.5	31	38	1.7	31	141	2.2
2,500	27	143	2.6	31	205	1.4	22	315	4.6	31	271	3.4	26	270	6.0	31	274	2.6	22	133	2.0	19	276	4.4	22	280	7.2	21	296	3.1	23	292	4.5	31	57	2.0	31	94	1.8
3,000	25	154	2.2	30	197	0.9	21	321	4.9	31	266	5.8	24	276	7.6	30	256	4.0	21	131	2.3	12	292	4.5	17	290	6.8	18	284	3.0	22	302	5.8	31	65	1.5	31	86	2.2
4,000	25	174	0.9	29	121	0.5	14	326	5.5	29	265	11.2	22	282	12.0	30	244	7.0	19	146	1.2							14	298	4.6	19	291	6.4	31	281	2.1	28	107	2.2
5,000	23	(1)	0.0	27	170	0.6	12	334	6.9	26	263	13.5	20	285	13.4	28	240	10.2	16	69	0.7							10	298	4.8	12	289	9.4	25	263	5.5	26	128	1.6
6,000	18	317	1.4	26	253	1.2	12	327	6.2	23	261	14.8	17	286	15.3	25	240	10.8	13	141	3.0													21	270	8.7	24	157	2.0
8,000	12	315	0.1	21	219	3.8				19	269	18.7	14	287	18.5	20	238	13.2	10	94	3.6													15	261	11.2	14	174	2.6
10,000				18	236	4.4				10	261	23.6	12	285	21.8	11	233	14.6																11	254	12.6	10	157	4.0
12,000				15	228	6.3																																	

Altitude (meters) M. s. l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (573 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (15 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	210	1.7	27	332	1.9	30	246	0.4	31	255	3.4	31	156	2.9	31	353	0.8	31	175	2.3	31	182	1.6	31	305	2.6	31	137	3.1	31	217	1.5	31	261	1.5	31	178	3.1
500							30	229	1.5				31	192	3.5	31	339	1.0				31	200	1.9	31	308	3.4	31	151	3.3	31	199	2.5	31	271	2.2	31	224	3.5
1,000							28	233	2.3	31	259	4.6	29	224	2.8	31	293	1.9	31	179	3.3	31	225	1.3	31	317	3.6	31	164	2.0	29	231	1.7	30	290	2.7	31	264	3.9
1,500				27	325	2.1	27	260	2.9	31	256	5.2	29	266	2.6	31	284	3.0	31	181	3.6	30	281	1.5	31	296	2.0	27	161	1.0	24	336	1.4	27	300	3.4	30	270	5.2
2,000	31	212	2.2	27	288	2.3	25	294	3.3	29	261	5.9	27	289	1.8	29	285	5.2	31	197	4.4	29	308	1.9	31	231	1.5	25	136	0.8	22	352	2.3	21	280	4.0	27	279	5.9
2,500	31	211	3.3	27	257	2.0	21	289	3.8	28	267	8.5	24	308	1.2	26	287	6.6	31	201	4.4	24	324	2.4	30	213	2.6	25	150	0.6	21	359	2.7	19	295	5.4	20	286	5.5
3,000	31	210	3.5	27	237	2.9	17	301	4.1	25	267	9.1	25	354	0.9	24	295	8.1	31	214	4.8	22	323	2.9	30	228	4.2	26	174	0.7	19	7	3.0	17	296	4.8	17	280	5.2
4,000	29	210	4.6	25	247	3.2	16	300	4.2	20	273	9.1	22	331	1.8	18	305	9.4	31	211	5.0	18	326	3.2	28	229	5.5	24	105	1.5	13	338	0.4	12	330	4.1	12	293	6.8
5,000	23	222	5.3	21	253	2.2	12	297	5.6	16	270	12.5	17	317	2.0	14	306	11.5	29	218	5.9	12	315	3.1	27	237	7.8	19	71	2.7				10	318	5.6	10	300	8.2
6,000	18	234	7.5	19	268	3.2				13	271	13.6	12	330	2.3	12	301	13.7	26	215	5.1				23	242	6.7	15	77	4.0									
8,000	13	234	13.8										10	336	3.3				23	218	9.0				22	232	8.9	12	61	4.6									
10,000																			22	217	14.0				15	218	10.3												
12,000																			21	222	14.5																		
14,000																			17	222	13.6																		
16,000																			12	202	8.0																		

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (388 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Paul, Minn. (225 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	275	6.0	31	158	5.0	31	161	1.4	31	274	1.6	31	112	1.1	30	278	0.8	31	214	2.1	30	151	2.9	31	273	3.9	30	287	2.9	30	259	2.4	31	225	2.7	31	196	0.7
500	31	279	3.6	31	155	5.3	31	168	1.4	31	276	2.4				30	282	1.3	31	216	2.6	30	135	3.8	31	296	2.7	30	284	3.2	30	246	1.8				31	209	2.2
1,000	29	280	2.1	31	164	4.8	31	193	2.7	31	264	2.1	31	117	1.0	30	279	1.8	31	238	3.6	30	136	4.1	31	264	1.4	30	285	4.4	24	252	1.3	31	220	3.7	28	223	2.5
1,500	29	246	1.1	31	174	4.9	31	231	3.5	31	253	3.3	31	108	0.8	30	281	2.7	30	258	3.6	29	145	2.8	30	260	2.1	29	285	4.7	21	223	1.2	31	229	3.7	25	266	3.0
2,000	29	205	1.5	31	181	4.4	31	249	4.5	31	243	3.1	31	204	0.2	30	286	3.9	27	281	5.0	28	96	1.1	30	222	3.1	28	304	4.9	19	219	1.9	30	228	4.3	21	279	4.4
2,500	28	181	2.8	31	200	2.9	29	268	5.4	31	246	2.3	31	243	2.5	26	295	5.5	24	283	6.7	27	129	1.8	30	212	3.6	27	299	6.0	19	234	3.7	27	232	6.1	17	291	6.0
3,000	28	190	3.5	30	219	2.5	28	276	5.4	31	214	2.3	31	254	5.0	24	293	6.8	23	291	8.7	24	111	2.1	30	206	4.5	25	299	6.9	17	234	5.6	25	244	7.5	15	300	7.1
4,000	28	202	5.1	25	244	2.0	25	295	5.8	31	166	2.5	27	270	9.0	23	292	8.3	21	298	11.2	20	93	3.6	27	204	4.3	23	299	7.6	16	236	7.9	22	234	11.6	14	289	9.5
5,000	27	208	6.0	19	294	1.6	18	301	7.9	30	172	3.3	22	275	12.2	20	301	8.0	15	299	12.3	15	32	2.5	25	195	3.9	18	309	9.6	16	237	10.3	15	243	14.8	10	287	9.0
6,000	27	208	7.7	17	313	3.2	17	299	9.1	27	156	3.7	17	272	13.5	18	294	8.9	12	302	13.0	12	87	2.4	23	191	4.3	16	317	11.8	13	240	10.0	13	242	16.3			
8,000	23	225	9.0	12	260	3.4	13	290	14.0	25	182	5.5	13	267	14.8	15	307	9.8				13	112	3.9	11	224	3.5							11	243	19.8			
10,000	18	222	11.2	10	237	6.7	10	292	17.2	24	196	8.5	10	269	22.8	11	305	9.4				11	109	5.8															
12,000	13	235	10.9							22	198	10.6																											
14,000										19	208	7.9																											

[1] calm.

TABLE 3.—*Maximum free-air wind velocities (m. p. s.), for different sections of the United States, based on pilot-balloon observations during July 1943*

Section	Surface to 2,2500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m). m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	34.0	wnw.	2,460	17	Portland, Maine	33.7	wnw.	2,500	17	Portland, Maine	60.3	w.	13,850	18	Portland, Maine.
East-Central [2]	20.9	wsw.	1,500	29	Cincinnati, Ohio	26.5	w.	3,520	7	Nashville, Tenn	38.6	w.	11,470	26	Huntington, W. Va.
Southeast [3]	21.4	wnw.	810	7	Birmingham, Ala	18.3	nnw.	4,960	31	Charleston, S. C	28.0	nne.	12,780	14	Atlanta, Ga.
North-Central [4]	34.7	sw.	1,610	2	Duluth, Minn	35.2	w.	5,000	14	Alpena, Mich	66.0	wnw	10,640	29	Saint Paul, Minn.
Central [5]	28.7	sse.	2,150	29	Dodge City, Kans	29.2	sw.	3,820	23	North Platte, Nebr	44.0	wnw.	10,650	14	Des Moines, Iowa.
South-Central [6]	24.6	ssw.	2,270	28	Houston, Tex	24.5	nw.	4,520	7	Texarkana, Ark	44.0	sw.	13,200	16	Oklahoma City, Okla.
Northwest [7]	35.6	nw.	2,480	28	Havre, Mont	33.3	wsw.	4,510	11	Pocatello, Idaho	57.6	sw.	9,610	28	Spokane, Wash.
West-Central [8]	33.1	sw.	2,500	11	Ely, Nev	38.5	w.	3,330	18	Casper, Wyo	55.0	ssw.	10,500	1	Ely, Nev.
Southwest [9]	24.4	ese.	1,850	13	Albuquerque, N. Mex	29.6	sw.	5,000	1	Las Vegas, Nev	49.5	ssw.	9,860	1	Las Vegas, Nev.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee and North Carolina.
[3] South Carolina, Georgia, Florida and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

River stages during July were decidedly below normal in the central Gulf States and in the Southwest, and below normal in an area extending from Maryland northward across central and eastern Pennsylvania and eastern New York. Elsewhere, normal, or above-normal, stages prevailed. Floods occurred principally in the Carolinas, the upper Mississippi Basin, and in the Columbia River Basin, but were mostly of a minor to moderate nature.

Precipitation during the month was above normal principally in Minnesota, Iowa, Indiana, Ohio, West Virginia, the Carolinas, Florida, and coastal areas of the west Gulf States; elsewhere there were general deficiencies. The driest areas were the central and south-central Mississippi Valley, the interior of the west Gulf area, the southern Great Plains and in the lower Potomac Valley.

Hudson Bay Drainage.—Two minor floods, causing slight damage, occurred in the Red River of the North at Moorhead, Minn., both originating during June, the first with a crest of 19.2 feet on June 6, and the second with a crest of 20.4 feet on July 2. Flood stage at Moorhead is 17 feet. No flood stages were reached at Wahpeton or at Grand Forks, N. Dak., upstream and downstream stations, respectively.

The early June rise was caused by heavy rainfall in connection with a disturbance which moved from eastern Nebraska to southwestern Minnesota on June 2. The 6-hour precipitation at Fargo, N. Dak., at 7:30 p. m., June 2, was 1.53 inches, and amounts of 1 inch or more occurred over much of the upper basin. These rains followed a showery period on May 29–30.

The rise late in June resulted from similar conditions. Rains of 0.5 inch occurred at many points. These rains were also preceded by a rainy period. At Hankinson, N. Dak., 1.34 inches of rain fell in a 48-hour period and the total for 7 days ending June 28 was 4.37 inches.

Great Lakes Drainage.—Moderate floods occurred in the Grand River and Flint River Basins in Michigan during June. This is the first time in 38 years that flood stages have occurred in the Grand River in the month of June. River stages were considerably above normal at the close of May from abnormally heavy precipitation. Heavy rains continued the first 2 days of June. Lowlands north of Grand Rapids were flooded from June 3 to 8 and the flood plains of the Grand River in Ionia and Kent Counties were inundated for several days, causing a loss to prospective crops estimated at about $1,000,000 in Ionia County.

Heavy rains on July 6–7 and 16–17, over the headwaters of the Maumee River Basin resulted in some flooding of lowlands. Flood stages were exceeded in the St. Joseph River at Montpelier, Ohio, on July 9, and in the St. Marys River at Decatur, Ind., July 17–18.

Flooding occurred in the vicinity of Toledo, Ohio, on July 6, when easterly winds causing high waves and tides in Lake Erie served to form breaks in an earthen dike along the Lake.

Atlantic Slope Drainage.—Precipitation was heavy during the month in the Carolinas and light to moderate overflows occurred principally in portions of the Roanoke, Neuse, Cape Fear, Pee Dee, Santee, and Savannah River watersheds. There were several periods during the first half of July when rainfall was heavy, mostly in the form of showers.

Upper Mississippi Basin.—High water and considerable flooding in the upper Mississippi Basin in June continued into July with a number of additional rises occurring in July. Reports of the floods are submitted by the officials in charge of the river district offices as follows (a report by the Minneapolis office was published in the June issue of the REVIEW):

LA CROSSE, WIS.

Widespread rains of the frontal thunderstorm type were responsible for three distinct flood periods in June; the first period beginning with a moderate flood in the Chippewa River on June 1 and culminating with flood conditions in the main channel of the Mississippi on June 7; the second beginning with floods in the Chippewa and extreme upper reaches of the Mississippi on June16, producing floods in the main channel from Reads, Minn., to Genoa, Wis., by June 22; and the third a flood of severe proportions in the Chippewa and extreme upper Black Rivers, beginning on June 27, which produced a secondary rise in the section from Reads to Genoa by July 2. Each succeeding flood took place on a fairly well developed recession from the former one. The flood occurring on the Chippewa at the end of June was most severe, and due to the fact that it was not supported by full flood volume from above Lake Pepin, considerable was lost in storage in that lake by flowing northward. This resulted in the flood stages from Reads to La

Crosse slightly under those occurring around June 22. A severe flood developed in the extreme upper Black River on June 27 and 28 with near all time record flow at Neillsville, Wis. Some flooding took place on the Cannon River on June 12 and somewhat less than bankful on the Zumbro River on the same date.

The floods were unusual in that one flood followed another in the main channel, just as recession from the former one had developed. This resulted in an exceptionally large volume flow with high mean stages for the month. In June 1880, when the extreme maximum stage of 16.2 feet was recorded at La Crosse, the mean stage was 11.7 compared to 11.6 in June 1943 when the crest stage was 13.3 feet. This record was brought about by the three major floods on the Chippewa and two on the Black River.

Flooding in the main channel of the upper Mississippi during July was the result of the third series of flood producing rains which fell from the 27th to the 30th of June. The Mississippi was above flood stage at La Crosse from July 1 to 6, cresting at 12.8 feet on the 3d; at Winona, Minn., from July 1 to 4, cresting at 14.0 feet on the 3d; and flood level was just reached at Reads, Minn., on July 1.

Thunderstorms the night of July 5–6 with excessive rainfall were general along the main channel of the river in this district and especially in drainage area of the Root, Zumbro, and Whitewater Rivers. In general, the rains were of short duration, but fell at a time when the soil was fairly well saturated. The volume of runoff was therefore considerably above average conditions. The Root River crested at 11.6 at 4 p. m. of the 6th, which is about 3 feet under bankful, so no particular damage resulted in this valley. The Zumbro at Theilman, Minn., crested at 38.6 at 4 p. m. of the 6th, or 2.6 feet above flood stage. Cornfields and gardens were flooded in the bottom lands resulting in considerable damage. The Whitewater at Beaver, Minn., crested at 5.9 feet (low-water elevation; flood stage 7 feet), about the same time. Agricultural losses here were not so pronounced.

DUBUQUE, IOWA

Two distinct floods occurred in the Wisconsin and Mississippi Rivers during June–July. The primary cause was widespread rainfall in heavy amounts and in considerable frequency. In some instances the rains were sufficiently restricted geographically so that some of the communities on the Wisconsin, which are especially susceptible to flood damage, were fortunate enough to escape losses.

The second flood set in upon a recession of the earlier one, and this fact was especially noteworthy in the Mississippi where warnings of the second rise were issued almost immediately after the first crest reached the lower limits of the district.

In the Wisconsin River floods, the general aspects were not especially different from the usual characteristics of the almost annual flood occurrences. In the Mississippi, however, the outstanding feature was the long persistence of high water. At Dubuque, the July flood produced the third occurrence of a flood stage during the year. This was the first record of three floods at Dubuque in any one calendar year, and the first occurrence of a flood in July.

Losses due to flooding were heavier than in recent years in crops and prospective crops, largely because the early season flood delayed planting, and the subsequent floods destroyed those crops which were well started, and so covered the lowland fields with rubbish and silt that replantings were difficult, if possible. Another crop damaging factor was the long persistance of the high water, to so late a time that replantings were impracticable.

DAVENPORT, IOWA

Two periods of relatively high water on the Mississippi River in the Davenport river district in June were the result of heavy rains in the upper Mississippi Basin, especially in Wisconsin and Minnesota. The first period extended from June 13–18, and the second from June 29 into the first half of July.

The floods were somewhat similar to the rise which occurred in April 1943. Tributary contribution to the flood waters in June were slightly less than in the April rise. This feature resulted in lower stages as the crest moved downstream than occurred during the April rise.

A local flood at Iowa City, Iowa, on the Iowa River occurred on June 2. It was not possible to issue warnings because of the suddenness and excessive nature of the precipitation causing it. The highest stage reported was 11.1 feet at about noon of June 2.

BURLINGTON, IOWA

From June 6, through June 30, moderate to severe flood conditions occurred on the Mississippi River from Keokuk, Iowa, to dam No. 24. High water from up-river began to enter the district on June 2 and this rise plus additional heavy rainfall in and above the district during the first half of the month caused rising stages almost continuously until June 18. A falling tendency set in on June 19 and continued until June 26 when a second rise from up-river entered the district. This rise was still in progress at the close of the month with all stages from Keokuk, Iowa, to Louisiana, Mo., above flood.

Heavy rainfall in northeast Missouri on June 9 and 10 caused the Salt River near New London, Mo., to exceed flood stage on June 11 and 12, with a crest of 21.3 feet on the 11th (flood stage 19 feet).

Flood conditions which prevailed from Keokuk, Iowa, to Louisiana, Mo., at the end of June continued past the middle of July due to locally heavy rains in and above the district from July 1 to 6.

Although this was one of the longest flood periods of record for this district, property and crop damage was relatively small. This was probably due to the fact that much of the fall wheat had been winter killed in some sections and also that considerable acreage had not been planted because of flood conditions earlier in the season.

CAIRO, ILL.

The flood in the Mississippi during June and July affected only a relatively small area in the vicinity of Cape Girardeau, Mo.; it may reasonably be considered a continuation of the flood of May–June which reached heights that have been exceeded only in 1844. Attaining a crest of 42.4 feet on May 27 the Mississippi River at Cape Girardeau declined to a stage of 30.3 feet on June 7, only 1.7 feet below flood stage, then, due to a series of heavy rains along the Missouri River and its tributaries and on the upper Mississippi a further rise developed, continuing until June 29 when a crest of 36.7 feet was recorded.

Flood stage at Cape Girardeau was passed on the morning of June 9. Later a rapid rise occurred in the Missouri River at Kansas City, resulting in a high flood there, and with additional frequent rains falling the river at Cape Girardeau rose steadily. However, such a large amount of water flowed from the main river through breaks which had been made in levees by the May flood that the time of the arrival of the crest at Cape Girardeau was greatly delayed and the ultimate stage was increased somewhat. It is interesting to note that, while the total rise at St. Louis was approximately 12.3 feet, at Cape Girardeau it was only about 6.4 feet; a part of this discrepancy can be accounted for by the fact that, in effect the river divided into two streams above Cape Girardeau when part of the water went into the storage basin, flooded the farm land inundated in May, and much of it did not return to the main river until after the crest had passed. A fall then began and the river passed below flood stage on July 4. It is remarkable that, despite the high stage at Cape Girardeau, the Ohio at Cairo and the Mississippi at New Madrid fell every day in June except on the 30th.

Ordinarily a flood of this proportion would have caused much damage on farms; however, the previous high water had totally destroyed crops and nothing of that nature remained to be damaged. The flood of June–July 1942, which reached a crest on July 2 of 36.9 feet (almost the identical stage during this flood), caused great crop damage in much of the area under consideration.

Missouri Basin.—A slight overflow in the Floyd River at James, Iowa, resulted from moderately heavy rains during the first week in July. The river crested at 15.0 feet on July 8, 1.0 foot above flood stage. No damage resulted.

The heavy rainfall extended over eastern Nebraska and northern Missouri and produced near flood conditions in the Platte River, and a slight overflow in the Grand River at Brunswick, Mo. The rise in the Platte River raised the stage in the Missouri with light flooding resulting at Nebraska City, Nebr., on July 5–7.

Ohio Basin.—A flash flood occurred in the vicinity of Steubenville, Ohio, on July 7, with a maximum rainfall of 6.81 inches recorded. The storm was very local and confined to the small tributary streams in that vicinity.

Damage has been estimated at more than $1,400,000 and two lives were lost.

Local flooding also occurred in northern Ohio areas from excessive rains on July 5.

A second flash flood occurred in the Pittsburgh area on July 27. The maximum official rainfall recorded was 3.9 inches at Mount Lebanon and 4.56 inches at Claysville, Pa. This storm was also of a local nature and affected sections in Pittsburgh and in the vicinity of Claysville, Pa., and Wheeling, W. Va. The damage from this storm along the small streams has been estimated at $1,000,000.

Heavy rainfall on July 28–29 in the Tygart River and Little Kanawha River Basins resulted in moderate overflows at Dailey and Hall, W. Va., on July 30–31 in the Tygart Basin and severe flooding in the headwaters of the Little Kanawha Basin, especially in the Little Kanawha River and Salt Lick Creek at Burnsville, W. Va., and in Tanners Creek at Spencer, W. Va. The overflows at these points are said to have been the worst in many years.

Pacific Slope Drainage.—The following report of the annual rise of the Columbia River during 1943 is submitted by the official in charge, Weather Bureau Office, Portland, Oreg.:

At the close of March 1943 mountain snow storage in the area drained by the Columbia River was generally much above normal. The excess was most pronounced in the upper portion of the Snake River Basin.

A careful study of climatological data, and of snow survey reports furnished by the United States Soil Conservation Service, led to the conclusion that, with normal conditions prevailing during the melting season, the Columbia River at Vancouver would reach a crest of 25 feet, and backwater in the Portland Harbor a crest of 24 feet. This forecast was released on April 16.

That this estimate was well founded is shown by the fact that more water passed the Celilo, Oreg., gage, the lowest recording gage on the Columbia River, in the period April 1 to June 30, inclusive, than in the corresponding period in 1928, when the crest was 24.4 at Portland and 25.4 at Vancouver, or in 1933, when the crest was 24.8 at Portland and 25.5 at Vancouver.

Because weather during the melting period was not normal, the crest fell far short of the early estimate; the highest at Portland was 19.8, and at Vancouver, 19.9. April was unusually warm throughout the Columbia River Basin. In Idaho it was the warmest since the phenomenally warm April of 1934.

The abnormal warmth caused an unusually early rise in the Columbia and its tributaries, from April 1 to 23. The Snake River reached 16.0 at Lewiston, Idaho, on April 20 and 21 and 12.8 at Weiser on April 21. At both places this was the highest reading for the season. At Lewiston it was the highest April reading since 1904 and at Weiser the highest April reading of record. At many stations in the Columbia Basin and at Portland, on the Willamette, the average stage for the month was the highest April average of record, and at others it was the highest for many years. At Portland the high April average was largely due to backwater from the Columbia, but not altogether so, for a Willamette flood reached its crest at Portland on April 3.

During the latter part of April and the first 3 weeks in May the river stages receded. The Columbia at Vancouver fell temporarily below the flood stage of 15 feet on May 6.

May and June were unusually cool except for short periods. In Oregon, May was less than 1 degree warmer than April, and June had the same mean temperature as the coldest June previously of record. In Washington, the mean temperature for June was the lowest since 1917, and in Idaho, the lowest since 1908.

A moderate warm spell late in May caused a substantial rise. The Columbia at Vancouver again reached the flood stage of 15 feet on May 29, and did not fall below that stage until July 17. Backwater from the Columbia again brought the Willamette at Portland to the flood stage of 18 feet, on the afternoon of June 1. Cooler weather in the mountains brought it below flood stage on the 8th, but it again rose above flood stage on the evening of the 20th, continuing above flood stage until July 7.

Because the rises were slow and ample warning was given, very little movable property was lost. Every Columbia River flood causes some loss of crops and pasture on undiked low lands; this is considered one of the normal risks. Rental of auxiliary pasture, and moving property from flood danger, particularly heavy goods from the lower levels of docks, entails large expense. Other losses were largely intangible. Incomplete statistics at hand indicate a loss of about $200,000 due to the flood.

FLOOD-STAGE REPORT FOR JULY 1943

[All dates in July unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
HUDSON BAY DRAINAGE	*Feet*			*Feet*	
Red of North: Moorhead, Minn.	17	June 4 June 29	June 9 6	19.2 20.4	June 6 2
ST. LAWRENCE DRAINAGE					
Lake Erie					
St. Marys: Decatur, Ind.	13	17	18	16.0	17
St. Joseph: Montpelier, Ohio	10	9	9	10.1	9
ATLANTIC SLOPE DRAINAGE					
James: Columbia, Va.	10	11	11	10.1	11
Roanoke:					
Weldon, N. C.	31	13	13	31.1	13
Williamston, N. C.	10	15	21	10.6	18–19
Neuse:					
Smithfield, N. C.	13	15	15	13.0	15
Goldsboro, N. C.	14	13 16	14 19	14.2 14.9	14 17–18
Haw: Moncure, N. C.	20	14	14	20.5	14
Cape Fear:					
Fayetteville, N. C.	35	14	15	37.6	15
Lock No. 2, Elizabethtown, N. C.	20	11	18	28.7	15
Pee Dee:					
Mars Bluff Bridge, S. C.	17	10	21	19.8	15–17
Poston, S. C.	18	15	23	19.8	17–18
Saluda:					
Pelzer, S. C.	6	2 11	4 11	6.7 6.0	3 11
Chappells, S. C.	13	1	2	15.1	2
Broad: Blairs, S. C.	14	10	11	16.8	11
Catawba:					
Catawba, N. C.	8	10	10	9.1	10
Catawba, S. C.	11	10	10	16.5	10
Savannah:					
Burtons Ferry, Ga.	15	7 15	10 18	15.7 15.0	8 15–18
Clyo, Ga.	11	9	26	13.9	13
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Chippewa: Durand, Wis.	11	(1)	2	14.3	June 30
Zumbro: Theilman, Minn.	36	6	6	38.6	6
Wisconsin: Portage, Wis.	17	2	2	17.5	2
Mississippi:					
Reads, Minn.	12	1	1	12.0	1
Winona, Minn.	13	1	5	14.0	3
La Crosse, Wis.	12	1	6	12.8	2–3
Dubuque, Iowa	18	6	10	18.7	8
Clinton, Iowa	16	(1)	13	17.1	June 30–1
Muscatine, Iowa	15	(1)	14	16.0	1–2, 11
Keithsburg, Ill.	12	(1) 9	5 14	12.4 12.3	2–3 11–12
Keokuk, Iowa	12	(1)	17	13.95	5
Gregory Landing, Mo.	12	(1)	18	14.2	5–6
Quincy, Ill.	14	(1)	18	16.6	5–6
Hannibal, Mo.	13	(1)	20	16.8	6
Louisiana, Mo.	12	(1)	20	14.9	7
Missouri Basin					
Floyd: James, Iowa	14	8	8	15.0	8
Grand: Brunswick, Mo.	12	5	12	12.6	9–10
Missouri: Nebraska City, Nebr.	15	5	7	15.5	6
Ohio Basin					
Buckhannon: Hall, W. Va.	10	30	31	[3] 10.2	30
Tygart, Dailey, W. Va.	9	30	31	12.7	30
Arkansas Basin					
Little Arkansas: Sedgwick, Kans.	18	19	19	[3] 18.3	19
Lower Mississippi Basin					
St. Francis: St. Francis, Ark.	18	(2)	3	19.3	May 31
PACIFIC SLOPE DRAINAGE					
Columbia Basin					
Willamette: Portland, Oreg.	18	(1)	7	19.8 18.3	June 24 June 30–4
Columbia:					
The Dalles, Oreg.	40	(1)	17	42.7	June 30–1, 3
Vancouver, Wash.	15	(1)	17	19.9 18.5	June 23–24 2–3

[1] Continued from June.
[2] Highest observed.
[3] Continued from May.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW January 1942, p. 15]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	81.9	+1.6	Gadsden	104	22	2 stations	60	[1] 1	4.72	−0.64	Coffee Springs	12.83	Belgreen	0.60
Arizona	80.4	+.2	Mohawk	123	25	Alpine	30	3	.98	−1.18	Ruby	4.02	4 stations	.00
Arkansas	82.9	+2.3	3 stations	110	22	Batesville	47	1	1.13	−2.89	Prescott	4.50	Waldron	.00
California	72.6	−.8	2 stations	124	[1] 26	3 stations	32	[1] 2	.04	−.03	Sierraville	1.35	189 stations	.00
Colorado	68.7	+1.5	Kit Carson	107	28	Pearl	23	14	1.41	−.73	Lake Moraine	4.44	2 stations	T
Florida	81.7	+.4	2 stations	103	23	Lake Alfred	61	24	8.18	+.89	Brooksville	17.03	Key West	1.72
Georgia	80.5	+.4	Camilla	106	23	Cornelia	57	2	5.30	−.47	Savannah	13.19	Fitzgerald	1.12
Idaho	67.6	−.6	Grand View	112	25	Big Creek	21	17	.52	−.15	Pierce	1.81	5 stations	T
Illinois	77.5	+1.0	East St. Louis	102	21	3 stations	45	1	3.00	−.26	Arlington Heights	8.65	Salem	.23
Indiana	76.3	+.6	2 stations	101	[1] 25	Wheatfield	41	1	4.22	+.87	Scottsburg	8.41	Cypress	1.17
Iowa	75.4	+.7	6 stations	98	[1] 12	2 stations	47	1	4.56	+.88	State Center	10.30	Le Claire (River)	1.33
Kansas	80.6	+1.4	Hoxie	112	26	do	44	14	2.85	−.26	Bonner Springs	7.70	Dodge City	.25
Kentucky	77.8	+.7	Russellville	102	2	Pippapass	48	1	4.21	+.01	Ford	9.26	Mayfield	.57
Louisiana	82.9	+1.0	Bastrop	107	24	2 stations	57	1	4.73	−1.41	Gueydan (near)	12.60	Shreveport	.99
Maryland-Delaware	75.6	+.3	4 stations	98	[1] 18	4 stations	35	1	2.45	−1.85	Oakland, Md.	5.29	Blackwater, Md.	.45
Michigan	69.6	+.3	Traverse City	96	13	Vanderbilt	30	1	2.82	+.09	Benton Harbor	12.14	St. James	.33
Minnesota	72.0	+1.9	Wheaton	99	31	Meadowlands	38	1	4.07	+.81	Albert Lea	13.52	2 stations	1.10
Mississippi	83.3	+2.2	Corinth	108	22	Batesville	57	1	2.78	−2.30	Bay St. Louis	10.84	Senatobia	.20
Missouri	79.6	+1.5	4 stations	104	[1] 22	Unionville	46	1	2.49	−1.09	Clifton Hill	7.72	Joplin	.07
Montana	66.7	−.5	Roundup	106	31	West Yellowstone	24	17	.99	−.49	Wibaux	3.91	Columbus	T
Nebraska	77.3	+1.7	2 stations	109	[1] 26	Chadron	42	14	3.01	−.07	David City	8.66	Scottsbluff	.22
Nevada	73.3	+.7	do	116	26	Golliher Pasture	23	12	.30	−.08	Wadsworth	1.54	7 stations	.00
New England	69.8	+.7	do	97	[1] 12	Vanceboro, Maine	33	2	4.31	+.55	Adams, Mass.	8.21	Greenville, Maine	1.70
New Jersey	74.2	+.4	Bridgeton	97	21	Layton	39	1	4.21	−.48	Hammonton	9.47	Cape May	.68
New Mexico	72.7	+.4	Orogrande	108	29	Selsor Ranch	28	4	1.96	−.51	Cloudscroft	8.04	Fruitland	.18
New York	70.7	+.9	3 stations	96	[1] 12	North Lake	34	1	3.96	+.04	Frankfort	9.19	Auburn	1.27
North Carolina	76.6	−.4	Louisburg	100	[1] 21	Mount Mitchell	43	24	7.89	+1.93	Sloan	16.46	Oxford	2.83
North Dakota	70.5	+1.5	New England	103	31	5 stations	41	2	2.72	+.27	Rolla	6.09	Watford City	1.05
Ohio	74.2	+.5	Ironton	97	[1] 17	Millport	38	1	6.01	+2.17	Steubenville	12.84	Brecksville	2.50
Oklahoma	84.0	+2.2	Tishomingo	120	26	Smithville	50	[1] 1	.96	−1.81	Enid	4.08	5 stations	.00
Oregon	65.3	−1.2	Huntington	108	25	Fremont	22	12	.30	−.12	Seaside	1.50	9 stations	.00
Pennsylvania	72.6	+.4	Phoenixville	100	22	Philipsburg	31	1	4.47	+.18	Claysville	11.31	Hewitt	1.27
South Carolina	79.5	−.4	Calhoun Falls	103	22	Caesars Head	52	2	7.22	+1.34	Wedgefield	13.79	Pinopolis	3.49
South Dakota	74.6	+1.4	4 stations	108	[1] 26	Custer	36	14	2.04	−.37	Andover	5.78	Cottonwood	.02
Tennessee	79.6	+1.8	3 stations	105	[1] 17	Milan	50	1	4.37	−.15	Gatlinburg	13.13	Memphis	.01
Texas	83.5	+.5	Bonham	112	24	Dumas	47	9	3.23	+.60	Port Arthur	24.25	3 stations	.00
Utah	72.8	+1.0	St. George	110	26	2 stations	28	13	.71	−.20	Hole in the Rock	2.13	Woodside	.00
Virginia	75.6	+.2	Columbia	99	17	Burkes Garden	41	10	4.85	+.21	Wallaceton	14.38	Quantico	.81
Washington	66.5	−.1	Wahluke (near)	106	25	3 stations	30	[1] 11	.53	−.15	Higley Peak	4.67	10 stations	.00
West Virginia	73.4	+.2	Martinsburg	101	17	Bayard	34	[1] 1	6.56	+1.90	Pickens	15.51	Williamson	1.97
Wisconsin	71.9	+1.7	Danbury	99	12	Meadow Valley	37	1	2.63	−.84	Beloit	6.13	Stevens Point	.54
Wyoming	67.3	+1.5	Arvada	105	31	3 stations	23	13	.71	−.62	Arbor	3.47	Jireh	.00
Alaska (June)	54.5	+1.9	Livengood	90	3	Wainwright	27	2	1.68	−.04	Whittier	11.30	Kotzebue	.10
Hawaii	75.2	+.9	2 stations	94	[1] 10	Volcano Observatory	51	29	6.07	+.16	Kukui	48.00	10 stations	.00
Puerto Rico	78.2	−.4	4 stations	94	[1] 13	Guineo Reservoir	56	11	5.96	−.29	La Mina (El Yunque)	16.84	Coamo Dam	.64

[1] Other dates also†

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Mean station	Mean sea level	Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01 inch or more	Wind: Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F		°F	°F		°F	°F	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*	
New England							68.7	+0.8									79	3.58	0.0										5.7			
Eastport	75	67	85	29.86	29.95	+0.02	60.2	−0.2	83	12	70	48	1	51	33	54	83	4.21	+1.1	14	7.7	s.	37	e.	30	8	16	7	5.5	.0	.0	4
Greenville, Maine	1,070	6	41	28.81	29.96	.....	64.1	−.9	91	13	78	37	2	51	39	58	.....	1.80	−2.5	9	.....	s.	.....	.....	.....	3	19	9	.....	.0	.0	5
Portland, Maine [1]	103	5	36	29.83	29.95	.00	68.6	.....	90	18	79	45	20	58	32	60	76	3.78	+.5	9	7.0	s.	27	e.	7	18	7	6	4.2	.0	.0	10
Concord [2]	289	4	45	29.64	29.96	.00	70.5	+2.0	93	10	84	39	2	58	41	60	74	5.18	+1.6	11	5.3	nw.	24	n.	22	7	18	6	5.5	.0	.0	8
Burlington [1]	403	11	48	.....	29.93	−.01	70.3	.0	92	11	81	49	2	59	.....	61	74	4.48	+1.0	13	6.9	s.	31	sw.	4	6	15	10	.....	.0	.0	11
Northfield	876	12	60	29.03	29.97	+.03	66.8	+.9	89	13	79	40	2	54	37	.....	.....	3.45	−.1	13	5.7	sw.	21	sw.	15	6	17	8	6.1	.0	.0	10
Boston [1]	124	33	62	29.82	29.96	.00	74.1	.....	93	18	83	53	1	66	25	62	70	3.91	+.4	10	9.7	sw.	28	sw.	5	4	13	14	6.5	.0	.0	7
Nantucket	12	10	63	29.96	29.98	.00	69.4	+1.6	83	21	76	57	2	63	18	65	90	4.10	+1.2	7	9.7	sw.	28	s.	22	10	3	18	6.5	.0	.0	5
Block Island	26	11	46	29.95	29.98	+.01	69.8	+1.4	82	27	76	55	1	63	19	64	88	4.01	+.9	12	12.4	sw.	34	nw.	22	16	7	8	4.0	.0	.0	8
Providence [2]	159	46	60	29.81	29.99	+.02	74.7	+1.3	92	21	84	51	1	65	29	64	77	1.97	−1.3	7	7.5	sw.	25	sw.	20	7	13	11	6.2	.0	.0	5
Hartford [1]	159	5	44	29.77	29.95	−.02	73.6	.....	91	27	84	49	2	64	35	63	74	3.27	−1.1	8	7.7	sw.	29	ne.	31	5	13	13	6.5	.0	.0	9
New Haven [1]	107	74	153	29.86	29.99	+.02	72.6	+.8	90	18	81	48	1	64	30	65	80	2.75	−1.3	9	6.2	sw.	19	ne.	7	6	17	8	5.8	.0	.0	8
Middle Atlantic States							76.2	+1.1									76	3.89	−0.4										6.1			
Albany [1]	97	26	40	29.84	29.96	.00	72.7	+1.8	91	12	84	45	2	61	40	61	72	2.96	+.2	9	7.0	s.	25	s.	5	6	12	13	6.1	.0	.0	10
Binghamton	871	57	79	29.06	29.99	+.02	72.6	+2.6	90	27	83	43	2	62	35	62	80	3.13	−.6	12	4.9	w.	21	nw.	27	3	10	18	7.2	.0	.0	7
New York	314	415	454	29.63	29.97	−.01	75.8	+2.0	89	21	83	55	1	68	21	63	71	3.87	−.4	10	11.3	s.	37	s.	5	8	10	13	6.0	.0	.0	12
Harrisburg [1]	374	30	49	29.58	29.98	.00	76.2	+1.4	94	21	87	50	1	66	33	64	70	2.05	−1.8	9	6.6	w.	29	s.	4	5	11	15	6.5	.0	.0	10
Philadelphia [2]	114	174	367	29.84	29.97	−.01	76.4	+.2	94	21	86	52	1	67	29	65	71	3.94	−.2	12	7.0	sw.	25	nw.	22	7	12	12	6.2	.0	.0	11
Reading	323	47	306	29.63	29.97	.....	76.4	+1.0	94	21	86	53	1	67	27	.....	.....	2.48	−1.8	10	9.0	s.	37	nw.	27	5	13	13	6.4	.0	.0	7
Scranton	805	72	104	29.14	29.99	+.01	73.8	+2.1	90	12	84	46	1	64	29	.....	.....	3.04	−1.0	8	5.7	sw.	22	nw.	22	7	17	7	5.8	.0	.0	9
Atlantic City	52	37	172	29.92	29.98	.00	73.0	+.9	92	16	79	54	1	67	21	66	83	1.64	−2.3	8	12.5	s.	35	ne.	7	10	11	10	5.6	.0	.0	9
Trenton	190	89	107	29.78	29.99	.....	75.8	+1.3	92	21	84	54	1	67	25	65	72	3.49	−.4	11	7.0	s.	24	nw.	27	5	12	14	6.7	.0	.0	9
Baltimore [2]	123	100	215	29.85	29.99	+.01	78.4	+1.2	95	21	86	55	1	70	21	66	71	4.95	+.3	9	8.6	s.	26	s.	20	9	12	10	5.6	.0	.0	9
Washington [2]	112	56	100	29.87	29.99	−.01	78.5	+1.7	94	21	88	56	1	70	25	66	72	1.46	−3.2	10	5.8	s.	20	w.	20	8	14	9	5.6	.0	.0	6
Cape Henry	18	8	54	29.97	30.00	.....	77.8	+.3	96	29	85	63	1	70	26	71	86	7.43	+2.1	15	8.7	sw.	35	nw.	17	6	13	12	6.2	.0	.0	15
Lynchburg	686	144	184	29.29	29.99	−.02	77.9	+.4	95	17	88	58	1	68	27	66	74	2.51	−1.7	13	5.8	w.	28	nw.	29	10	10	11	5.6	.0	.0	14
Norfolk [2]	91	80	125	29.91	30.01	+.01	79.1	+.4	95	17	87	62	2	71	23	71	85	10.27	+4.5	15	7.8	sw.	32	w.	29	3	14	14	6.9	.0	.0	13
Richmond [2]	144	11	52	29.83	29.98	−.03	78.4	−.1	96	17	88	57	2	69	25	68	78	5.08	+.4	12	6.7	sw.	37	sw.	17	8	14	9	5.7	.0	.0	14
South Atantic States							79.8	+0.6									83	7.69	+1.9										6.3			
Asheville	2,253	89	104	27.75	30.04	+.02	74.0	+2.3	93	16	84	56	2	64	28	65	82	6.81	+2.5	13	5.3	nw.	21	nw.	30	5	8	18	7.5	.0	.0	14
Charlotte [2]	779	63	86	29.20	30.01	−.01	79.2	+.8	98	18	88	59	1	70	26	70	82	7.00	+1.9	12	5.3	sw.	25	w.	29	3	12	16	6.7	.0	.0	13
Greensboro [1]	886	6	56	29.10	30.02	.....	76.8	.....	94	17	86	60	2	68	24	69	84	4.43	.....	14	5.9	sw.	31	n.	18	7	10	14	6.5	.0	.0	14
Hatteras	11	5	50	29.99	30.01	.00	78.4	+.2	87	17	83	63	1	74	14	74	87	4.74	−.8	14	10.3	sw.	27	w.	18	6	13	12	6.1	.0	.0	9
Raleigh [1]	376	27	69	29.62	30.01	−.01	79.2	+.4	97	17	89	60	2	70	30	70	85	6.46	+1.1	10	6.3	sw.	40	nw.	29	4	10	17	6.9	.0	.0	14
Wilmington	72	73	107	29.94	30.01	.00	78.9	−.2	92	18	86	63	1	72	22	73	86	10.32	+3.2	22	8.2	sw.	26	nw.	22	2	18	11	6.4	.0	.0	20
Charleston [2]	48	11	92	29.96	30.01	−.02	82.0	+.6	96	30	89	68	2	75	23	74	88	8.61	+1.7	15	8.7	s.	32	n.	23	13	10	8	4.9	.0	.0	13
Columbia, S. C. [2]	347	70	91	29.63	30.00	−.02	80.8	−.1	98	22	90	62	2	72	24	73	81	4.46	−.9	14	6.2	s.	34	n.	18	6	11	14	6.4	.0	.0	12
Greenville, S. C. [1]	1,040	70	78	28.94	30.01	.....	77.4	+.5	97	18	86	57	2	68	29	69	81	6.99	+1.6	17	6.5	sw.	57	n.	22	5	13	13	6.7	.0	.0	18
Augusta [2]	182	62	77	29.81	30.00	−.02	81.6	+.3	99	22	91	65	2	73	23	70	75	6.74	+1.4	17	4.9	s.	23	s.	7	8	13	10	5.7	.0	.0	14
Savannah [2]	65	73	152	29.95	30.02	−.01	83.0	+1.5	100	18	92	70	3	74	24	74	81	13.19	+6.6	13	8.2	sw.	33	w.	19	9	17	5	4.8	.0	.0	13
Jacksonville [2]	43	86	110	30.00	30.05	−.02	82.8	+.7	96	6	92	67	23	74	26	73	82	9.22	+2.5	17	6.5	sw.	29	ne.	23	1	20	10	6.6	.0	.0	17
Florida Peninsula							82.4	+0.5									79	6.13	+0.5										6.0			
Key West [2]	21	10	64	30.02	30.05	+.02	85.0	+1.5	92	26	90	75	5	80	13	73	72	1.72	−1.6	10	7.3	se.	17	se.	25	5	23	3	5.2	.0	.0	13
Miami [3]	25	124	168	30.02	30.06	+.02	80.4	−.6	89	21	85	68	10	76	19	73	82	5.86	+.4	14	8.9	se.	42	w.	10	4	17	10	6.2	.0	.0	14
Tampa [1]	35	5	61	30.01	30.06	+.02	81.7	+.5	93	31	89	69	23	75	20	74	84	10.80	+2.8	19	7.5	s.	36	sw.	23	0	21	10	6.7	.0	.0	29
East Gulf States							82.1	+1.2									79	5.01	−0.8										5.9			
Atlanta [1]	1173	5	72	28.81	30.02	.00	79.9	+.8	98	22	90	61	2	70	27	70	79	2.70	−2.1	16	7.3	w.	37	n.	6	1	13	17	7.0	.0	.0	12
Macon [2]	370	79	87	29.62	30.01	−.01	81.3	+.1	99	22	91	66	3	71	27	72	81	5.09	+.4	12	5.5	nw.	23	n.	6	10	18	3	4.7	.0	.0	13
Thomasville	273	49	58	29.77	.....	.....	82.2	+.4	100	23	92	68	12	72	26	.....	.....	5.04	−1.7	15	.....	.....	.....	.....	.....	0	17	14	.....	.0	.0	20
Apalachicola	35	11	51	29.99	30.03	.....	81.5	−.2	95	23	88	68	7	75	23	74	80	8.94	+1.2	19	6.6	w.	29	nw.	7	2	17	12	6.4	.0	.0	20
Pensacola	56	54	79	29.96	30.02	+.01	83.4	+2.4	99	7	90	71	11	76	25	75	82	5.47	−1.3	17	6.8	w.	24	sw.	11	3	22	6	6.0	.0	.0	17
Anniston	741	9	.....	.....	.....	.....	80.0	+2.1	97	22	91	64	2	69	28	.....	.....	6.61	+1.4	13	.....	.....	.....	.....	.....	11	13	7	.....	.0	.0	11
Birmingham [3]	700	11	48	29.29	30.01	.00	81.0	+.8	99	22	91	66	20	71	28	71	79	4.99	.....	12	6.0	sw.	41	n.	6	4	16	11	6.2	.0	.0	16
Mobile [2]	57	6	30	29.96	30.02	+.01	83.4	+2.0	98	23	92	71	7	75	27	74	84	7.37	+.5	15	5.7	s.	31	n.	7	2	16	13	6.4	.0	.0	14
Montgomery [2]	218	92	105	29.78	30.01	−.01	82.8	+1.1	99	23	92	70	10	74	23	72	76	3.03	−1.8	11	6.2	w.	21	s.	27	5	13	13	6.2	.0	.0	11
Meridian [2]	375	67	92	29.62	30.01	−.01	82.8	+2.4	100	22	94	68	6	72	31	72	76	3.57	−1.3	11	5.3	sw.	22	nw.	6	11	14	6	4.8	.0	.0	9
Vicksburg [2]	247	82	102	29.74	29.99	−.01	83.5	+2.2	99	23	92	64	1	75	23	71	78	.58	−4.0	3	7.2	sw.	24	n.	15	9	15	7	5.3	.0	.0	7
New Orleans [3]	53	76	84	29.95	30.01	+.01	83.0	+.6	98	24	91	69	10	75	20	74	77	6.68	+.3	14	6.2	w.	22	e.	25	8	11	12	5.8	.0	.0	16
West Gulf States							84.3	+1.5									71	5.81	+2.5										5.3			
Shreveport [1]	249	5	64	29.72	29.98	.00	85.0	+1.8	102	23	96	62	1	74	30	71	69	.99	−2.6	7	8.5	sw.	36	ne.	6	4	18	9	6.1	.0	.0	6
Fort Smith	463	57	82	29.48	29.93	−.04	85.6	+4.1	106	22	97	61	1	74	30	68	61	.34	−3.0	3	6.1	e.	31	ne.	24	7	24	0	4.7	.0	.0	5
Little Rock [1]	357	94	102	29.60	29.98	−.01	84.4	+3.5	105	22	96	58	1	72	32	70	68	1.85	−1.6	4	7.1	sw.	39	n.	20	7	18	6	5.5	.0	.0	5
Austin [1]	605	11	41	29.32	29.94	.....	83.8	−.2	102	7	94	68	1	74	31	71	73	3.91	+1.6	8	8.5	s.	32	n.	26	10	12	9	5.3	.0	.0	8
Brownsville [2]	57	88	96	29.87	29.92	.....	85.6	+2.0	100	26	94	73	25	77	25	74	76	.34	−1.9	2	12.4	se.	30	se.	12	8	15	8	5.7	.0	.0	1
Corpus Christi [1]	20	11	78	29.93	29.95	−.01	84.5	+2.9	99	25	94	71	5	76	26	74	80	.48	.....	6	11.9	se.	29	se.	13	18	6	7	4.1	.0	.0	7
Dallas [1]	512	6	46	29.42	29.95	.....	85.6	.....	105	24	96	64	1	75	29	68	60	.27	−2.6	2	10.7	s.	32	e.	26	10	16	5	4.4	.0	.0	5
Fort Worth [1]	679	35	56	29.26	29.94	−.02	86.1	+2.5	106	24	98	65	2	74	30	66	58	.73	−1.9	2	10.7	s.	34	se.	26	10	15	6	4.7	.0	.0	5
Galveston [2]	54	106	114	29.91	29.97	−.01	82.6	−.8	95	24	87	70	27	78	20	76	84	17.96	+14.2	9	11.2	s.	63	nw.	27	6	17	8	5.7	.0	.0	7
Houston [2]	138	157	190	29.82	29.96	.....	83.2	−.5	99	24	92	69	25	75	29	73	79	13.53	+9.5	11	10.0	se.	59	nw.	27	9	11	11	5.8	.0	.0	8
Palestine	510	64	72	29.46	29.98	+.01	83.6	+1.4	102	24	93	64	1	74	25	69	70	1.83	−.8	7	7.1	s.	27	s.	29	14	12	5	4.8	.0	.0	3
Port Arthur	34	59	134	29.95	29.98	.....	83.4	.....	99	24	91	69	1	76	27	74	79	24.25	+17.3	13	12.3	s.	54	se.	27	4	13	14	6.5	.0	.0	10
San Antonio [1]	693	28	59	29.24	29.94	−.01	83.4	−.4	102	8	94	68	7	72	32	69	72	3.72	+1.6	7	8.2	se.	40	ne.	27	10	13	8	5.5	.0	.0	12

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Mean station	Pressure: Mean sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
Ohio Valley and Tennessee	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F		°F	°F		°F	°F	°F	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*	
							77.4	**+1.3**									**76**	**5.28**	**+1.4**										**5.5**			
Chattanooga [1]	762	21	54	29.20	30.00	−.02	78.8	+1.4	98	22	89	63	2	69	28	70	81	6.55	+2.3	15	4.7	s.	34	w.	9	6	14	11	6.3	.0	.0	16
Knoxville [2]	995	66	84	28.98	30.02	−.00	78.0	+.9	97	16	88	61	1	67	28	69	80	9.29	+4.9	18	6.0	sw.	37	n.	29	10	13	8	5.1	.0	.0	14
Memphis [2]	399	78	86	29.55	29.96	−.04	83.8	+3.1	103	22	94	59	1	73	31	71	70	.01	−3.2	1	7.4	sw.	18	sw.	3	13	15	3	4.2	.0	.0	6
Nashville [1]	546	5	72	29.40	29.98	−.03	81.8	+2.7	100	17	93	57	1	71	31	68	70	2.51	−1.4	9	6.8	s.	34	nw.	19	8	17	6	5.1	.0	.0	12
Lexington	989	6	....	28.97	....	....	77.6	+1.7	97	25	90	54	1	66	32	....	....	7.68	+4.0	18	....	s.	....	....	....	9	16	6	4.9	.0	.0	15
Louisville [2]	525	106	120	29.42	29.98	−.02	78.3	−.3	95	16	87	58	1	70	23	68	75	2.35	−1.4	9	6.9	sw.	29	w.	17	15	8	8	4.2	.0	.0	8
Evansville [1]	431	5	38	29.51	29.97	−.03	78.8	+2.3	97	25	90	58	1	68	27	68	73	2.88	−.5	9	6.1	sw.	28	nw.	17	8	20	3	4.9	.0	.0	10
Indianapolis [1]	823	98	129	29.11	29.98	−.01	75.8	+1.5	94	27	87	55	1	65	28	67	77	3.02	....	8	7.4	sw.	35	w.	14	7	15	9	5.7	.0	.0	10
Terre Haute [2]	575	68	149	29.37	29.97	....	79.1	+2.5	97	28	90	58	2	68	29	66	72	2.89	−.3	5	7.3	sw.	49	nw.	28	6	17	8	5.4	.0	.0	8
Cincinnati [2]	627	11	51	29.32	29.98	−.02	77.4	+2.3	95	28	88	56	1	67	28	67	76	4.58	+1.3	11	5.4	sw.	21	w.	28	7	11	13	6.0	.0	.0	14
Columbus [2]	822	90	110	29.12	29.97	−.03	76.2	+1.3	92	27	86	53	1	67	26	65	75	7.05	+3.5	13	7.5	s.	34	w.	21	7	14	10	5.8	.0	.0	9
Dayton [1]	900	6	55	29.04	29.98	....	75.6	+.2	91	25	85	52	1	66	25	64	74	4.43	+1.1	15	8.4	nw.	49	w.	25	3	18	10	6.0	.0	.0	16
Elkins	1,947	61	78	28.02	30.03	+.02	70.6	+.3	88	17	81	44	1	60	31	64	87	9.35	+4.0	14	4.6	se.	28	nw.	17	3	10	18	7.0	.0	.0	13
Parkersburg	637	77	84	29.31	29.99	−.02	76.0	+.6	92	17	86	52	1	65	30	66	79	6.29	+2.0	14	4.5	se.	27	nw.	22	8	8	15	6.1	.0	.0	16
Pittsburgh [1]	842	39	54	29.10	30.00	.00	73.2	−.6	88	12	83	46	1	64	28	62	74	7.99	+3.9	18	8.3	s.	42	nw.	27	9	14	8	5.1	.0	.0	16
Lower Lake Region							**72.6**	**+1.6**									**74**	**4.75**	**+1.5**										**5.4**			
Buffalo [2]	768	243	280	29.16	29.98	+.01	71.6	+1.8	89	9	82	48	1	62	31	62	74	1.73	−1.3	10	9.9	sw.	33	sw.	15	7	13	11	6.0	.0	.0	7
Canton	448	10	61	29.46	29.93	....	70.6	+1.7	90	10	81	46	1	60	29	60	73	2.79	−.7	8	6.5	w.	28	sw.	15	6	15	10	5.8	.0	.0	10
Oswego	335	71	85	29.59	29.98	.00	70.6	+.2	88	27	78	50	2	63	23	60	72	3.28	+.4	11	7.1	w.	25	n.	22	13	12	6	4.3	.0	.0	9
Rochester [1]	523	5	69	29.41	29.98	+.01	71.8	+2.0	91	12	83	45	1	61	34	61	73	2.90	−.1	10	6.9	w.	28	nw.	14	9	11	11	5.8	.0	.0	9
Syracuse [1]	596	5	51	29.33	29.98	−.01	72.3	+3.0	91	12	83	45	2	61	35	61	71	1.91	−1.8	10	8.0	sw.	33	nw.	27	7	13	11	5.8	.0	.0	8
Erie [2]	714	57	81	29.23	29.99	+.01	72.5	+1.5	88	12	80	53	2	66	22	63	77	6.27	+3.3	12	6.5	w.	20	ne.	21	7	17	7	5.4	.0	.0	8
Cleveland [1]	762	27	54	29.17	29.98	−.01	74.0	+2.1	89	21	84	47	2	64	34	64	75	5.37	+1.9	13	8.0	se.	35	sw.	21	6	12	13	5.9	.0	.0	15
Sandusky	629	5	67	29.30	29.98	−.01	75.1	+1.7	91	21	84	51	1	66	30	....	....	9.71	+6.3	14	6.9	sw.	21	sw.	21	9	12	10	5.2	.0	.0	12
Toledo [2]	628	79	87	29.31	29.98	−.01	73.2	.0	90	25	84	49	1	63	31	65	79	6.05	+3.0	14	8.6	sw.	32	sw.	21	16	14	1	3.5	.0	.0	13
Fort Wayne [1]	857	69	84	29.07	29.97	....	73.8	+1.4	91	3	85	49	1	63	32	64	74	6.25	+2.6	14	5.7	w.	38	n.	21	9	13	9	5.5	.0	.0	14
Detroit [1]	730	5	78	29.21	29.98	.00	73.5	+2.5	89	13	84	50	1	63	30	62	69	6.01	+2.7	9	7.6	w.	29	ne.	30	6	11	14	5.9	.0	.0	9
Upper Lakes Region							**70.6**	**+2.8**									**73**	**2.83**	**−0.3**										**5.0**			
Alpena	609	5	89	29.32	29.98	+.01	67.4	+1.5	83	26	76	45	1	58	26	58	73	3.05	+.3	12	8.4	nw.	26	sw.	14	13	11	7	4.9	.0	.0	6
Escanaba	612	51	72	29.31	29.96	−.01	70.3	+4.3	87	30	79	51	1	62	24	61	75	2.02	−1.3	12	8.6	s.	31	nw.	21	7	16	8	5.2	.0	.0	3
Grand Rapids [2]	707	70	244	29.23	29.98	.00	74.3	+2.0	94	13	84	53	1	64	27	61	71	3.20	+.3	7	8.1	sw.	31	sw.	21	8	20	3	5.0	.0	.0	10
Lansing [2]	878	5	90	29.06	29.98	....	70.4	−.5	87	26	81	46	1	60	28	62	71	3.87	+.8	8	6.2	w.	18	nw.	18	11	15	5	4.9	.0	.0	7
Marquette	734	44	73	29.16	29.95	−.01	69.2	+4.3	95	13	78	51	6	60	27	58	70	3.08	.0	10	6.5	e.	25	s.	2	12	14	5	4.7	.0	.0	7
Sault Sainte Marie [1]	614	11	43	29.31	29.97	.00	64.8	+2.1	92	13	77	40	1	53	36	58	79	1.59	−1.1	7	7.7	w.	29	nw.	15	14	8	9	4.7	.0	.0	5
Chicago [1]	673	19	38	29.26	29.97	−.01	73.7	+3.0	95	3	86	53	1	65	32	62	66	5.14	+1.7	7	6.9	e.	31	nw.	29	9	13	9	5.4	.0	.0	8
Green Bay	617	109	141	29.31	29.98	+.01	73.0	+3.0	93	13	83	55	1	63	27	64	75	2.54	−.9	9	8.0	s.	34	w.	27	9	17	5	5.3	.0	.0	5
Milwaukee [1]	681	33	66	29.26	29.97	.00	71.8	+3.6	95	13	82	50	1	62	29	61	70	1.54	−1.3	7	8.7	w.	27	nw.	21	12	12	7	4.9	.0	.0	6
Duluth	1,133	5	47	28.75	29.96	+.01	69.0	+5.1	87	9	80	49	6	58	36	60	78	2.26	−1.5	10	8.6	w.	32	nw.	13	11	17	3	4.9	.0	.0	8
North Dakota							**71.9**	**+3.4**									**69**	**2.19**	**−0.4**										**3.8**			
Fargo	940	5	43	28.91	29.90	−.04	73.0	+4.9	95	31	85	55	17	61	33	63	72	2.52	−.9	11	10.2	s.	48	w.	12	17	9	5	3.8	.0	.0	12
Bismarck	1,677	4	41	28.16	29.91	−.02	72.6	+3.2	95	31	86	52	17	60	35	60	69	2.15	−.1	10	8.9	se.	61	w.	12	17	12	2	3.3	.0	.0	16
Devils Lake	1,478	11	44	28.36	29.92	−.01	71.1	+3.7	92	22	82	51	17	60	32	60	72	2.27	−.3	11	7.1	s.	34	n.	12	15	10	6	4.3	.0	.0	11
Grand Forks	832	11	71	29.02	29.90	....	71.8	....	93	31	85	53	27	59	34	62	....	3.47	....	6	....	s.	....	....	....	14	12	5	....	.0	.0	11
Williston	1,878	42	50	27.96	29.88	−.04	70.8	+1.9	95	24	84	48	27	58	41	54	63	1.81	−.1	10	5.6	w.	26	e.	11	14	13	4	3.7	.0	.0	9
Upper Mississippi Valley							**76.9**	**+1.8**									**71**	**2.89**	**−0.6**										**4.7**			
Minneapolis-St. Paul, Minn. [1]	919	32	61	28.98	29.94	−.01	74.6	+2.3	93	12	84	57	1	65	29	64	73	3.78	.0	13	7.8	sw.	34	sw.	13	12	11	8	4.9	.0	.0	11
Springfield, Minn	1,025	4	42	28.86	29.94	....	75.2	....	96	12	87	55	1	63	35	63	72	6.52	....	12	....	s.	....	....	....	13	10	8	....	.0	.0	11
La Crosse [2]	714	11	48	29.20	29.95	−.01	73.2	+.4	92	13	84	50	1	63	26	64	76	2.28	−1.6	12	6.5	se.	34	n.	26	9	13	9	5.0	.0	.0	13
Madison [2]	974	70	78	28.96	29.97	.00	74.0	+1.9	91	13	83	53	1	65	28	63	71	3.00	−.9	6	5.7	nw.	25	ne.	5	11	13	7	4.9	.0	.0	10
Charles City [1]	1,015	10	51	28.93	30.00	−.04	73.8	+1.5	93	12	84	54	1	63	31	....	....	3.52	−.2	9	4.7	s.	22	se.	28	18	7	6	3.7	.0	.0	8
Davenport [2]	606	66	161	29.33	29.98	+.01	75.9	+.6	96	13	88	51	1	64	30	64	69	2.10	−1.2	10	6.8	sw.	34	sw.	31	8	14	9	5.4	.0	.0	9
Des Moines	860	5	99	29.05	29.95	−.01	77.0	+1.6	94	13	87	56	2	67	27	66	74	4.45	+1.0	11	7.4	se.	32	w.	24	13	15	3	4.1	.0	.0	13
Dubuque	699	60	79	29.23	29.96	−.01	76.6	+2.5	94	13	86	55	1	67	26	64	67	2.71	−1.2	9	4.7	s.	26	n.	29	11	13	7	5.3	.0	.0	9
Burlington, Iowa [1]	702	6	35	29.23	29.97	−.01	77.2	+1.4	97	26	88	58	2	66	29	65	73	3.81	+.2	9	6.3	s.	29	w.	29	9	17	5	4.8	.0	.0	9
Cairo	357	5	99	29.60	29.97	−.03	82.4	+2.8	98	17	92	57	1	72	26	....	....	2.08	−1.0	9	6.6	sw.	37	ne.	26	11	12	8	5.1	.0	.0	11
Peoria [2]	609	11	45	29.34	29.99	+.01	76.1	+.7	95	26	87	57	9	65	30	64	68	2.56	−1.0	8	5.9	sw.	55	nw.	28	14	15	2	3.9	.0	.0	8
Springfield, Ill. [2]	636	5	191	29.30	29.97	−.01	79.8	+3.3	97	27	90	60	8	69	27	66	72	3.03	+.2	10	8.3	s.	46	n.	4	8	13	10	5.8	.0	.0	7
St. Louis [2]	568	179	303	29.38	29.97	−.02	81.8	+3.0	99	28	90	61	1	73	22	66	65	1.31	−1.7	8	9.4	sw.	26	sw.	3	15	11	5	4.0	.0	.0	10
Missouri Valley							**78.9**	**+3.2**									**68**	**3.61**	**−0.1**										**4.2**			
Columbia, Mo. [2]	784	6	66	29.15	29.96	−.02	80.1	+3.2	99	28	90	61	9	70	29	67	70	6.42	+2.9	7	5.9	s.	23	nw.	16	14	13	4	4.2	.0	.0	8
Kansas City [1]	963	38	76	28.95	29.95	−.02	81.4	+3.3	103	23	92	60	1	71	31	66	65	3.39	−.4	11	8.7	ne.	39	sw.	5	14	11	6	4.5	.0	.0	11
St. Joseph [2]	967	11	49	28.95	29.95	....	80.0	+2.6	97	23	90	61	1	70	31	66	68	2.39	−1.4	9	6.9	se.	30	nw.	5	22	9	0	2.7	.0	.0	9
Springfield, Mo. [1]	1,324	5	60	28.62	29.98	.00	79.2	+3.0	97	23	90	53	1	68	29	67	71	2.39	−1.8	4	7.6	s.	32	n.	31	10	15	6	5.0	.0	.0	6
Topeka	987	65	87	28.92	29.94	....	81.6	+3.8	104	23	93	61	1	70	32	68	68	4.29	.0	10	7.1	s.	31	n.	19	13	13	5	4.5	.0	.0	9
Lincoln [2]	1,189	11	81	28.71	29.93	−.02	79.2	+2.7	101	20	90	59	14	68	31	65	67	4.39	+.5	14	7.8	s.	36	nw.	5	15	9	7	4.2	.0	.0	14
Omaha [1]	1,105	31	44	28.81	29.94	−.01	78.3	+3.1	95	12	89	58	1	68	29	66	70	3.90	+.4	14	9.1	s.	36	s.	18	12	15	4	4.6	.0	.0	18
Valentine	2,598	46	54	27.28	29.94	+.01	76.8	+3.1	103	26	91	48	14	63	41	54	52	1.25	−1.8	6	8.9	s.	42	sw.	12	15	13	3	3.8	.0	.0	16
Sioux City [1]	1,138	5	27	28.76	29.94	−.01	76.4	+3.1	96	12	88	55	14	64	33	66	73	4.66	+1.1	9	8.6	s.	34	nw.	20	10	14	7	4.7	.0	.0	10
Huron	1,301	5	41	28.56	29.92	−.02	75.6	+3.8	105	31	89	49	14	62	42	63	71	2.82	−.3	6	10.9	s.	34	s.	15	17	8	6	4.0	.0	.0	8
Northern Slope							**70.7**	**+1.9**									**53**	**1.06**	**−0.5**										**4.0**			
Billings [1]	3,570	18	39	26.34	29.90	....	72.4	+.4	101	31	87	48	17	57	42	45	44	.48	....	6	9.6	sw.	54	n.	12	13	14	4	4.3	.0	.0	7
Havre	2,507	11	67	27.35	29.92	+.01	70.4	+2.1	97	21	86	46	12	55	45	46	50	.39	−1.5	6	7.8	sw.	34	sw.	3	17	11	3	3.5	.0	.0	9
Helena [1]	4,124	5	35	25.86	29.96	+.03	67.6	+1.9	96	25	84	41	17	52	47	44	49	.18	−1.0	6	9.6	w.	38	w.	21	20	9	2	3.4	.0	.0	9
Missoula [2]	3,205	80	91	26.69	30.01	....	67.6	.0	99	8	83	42	12	52	44	47	58	.78	−.2	6	6.2	w.	24	nw.	3	16	11	4	3.5	.0	.0	2
Kalispell	2,973	48	56	26.96	29.94	+.01	64.8	+.7	93	20	79	42	5	51	39	46	59	.45	−.6	4	6.4	w.	18	w.	3	13	14	4	3.9	.0	.0	4
Miles City [2]	2,371	48	55	27.47	29.91	−.01	73.4	+.5	103	31	89	46	13	58	45	52	56	1.04	....	8	....	nw.	....	....	....	18	10	3	3.8	.0	.0	10
Rapid City [2]	3,259	50	58	26.64	29.93	.00	73.4	+2.4	101	31	88	49	14	58	42	54	57	2.51	+.4	8	11.8	nw.	43	nw.	12	13	14	4	4.3	.0	.0	15
Cheyenne [1]	6,094	5	39	24.13	29.95	+.03	69.8	+3.1	92	12	86	45	5	54	40	48	55	1.25	−.8	8	8.8	w.	34	sw.	21	10	18	3	4.7	.0	.0	11
Lander	5,352	60	68	24.74	29.91	−.01	69.9	+2.5	95	31	87	42	13	53	44	40	40	.08	−.6	3	5.4	sw.	36	sw.	27	14	11	6	4.3	.0	.0	6
Sheridan [4]	3,790	6	42	26.15	29.94	....	70.5	+2.1	99	31	87	40	13	54	47	47	52	1.83	+.6	5	7.0	nw.	47	w.	27	18	8	5	3.5	.0	.0	10
North Platte [2]	2,821	11	51	27.07	29.91	−.02	77.7	+4.8	102	26	90	49	14	65	39	59	60	2.10	−.6	11	7.3	s.	24	sw.	11	12	18	1	4.4	.0	.0	15

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Mean station	Pressure: Mean sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F		°F	°F		°F	°F	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*	
Middle Slope							79.1	+2.9									57	1.58	−1.3										4.3			
Denver [2]	5,292	106	113	24.83	29.92	+.01	75.9	+3.7	96	26	88	58	3	64	31	47	46	.78	−.9	6	7.4	s.	27	n.	28	15	14	2	3.8	.0	.0	11
Pueblo [1]	4,690	5	36	25.35	29.90	−.01	76.0	+1.8	101	28	92	53	14	60	42	50	49	.98	−1.0	5	8.5	nw.	34	w.	14	10	18	3	4.6	.0	.0	16
Concordia	1,392	50	58	28.51	29.94	−.01	79.6	+1.6	102	23	91	68	1	68	30	65	68	1.98	−1.8	8	6.9	s.	30	ne.	13	14	13	4	4.4	.0	.0	8
Dodge City [1]	2,509	10	86	27.39	29.90	−.03	82.0	+3.6	104	21	95	63	11	69	33	60	54	.25	−2.9	8	14.0	s.	41	n.	13	6	21	4	5.3	.0	.0	13
Wichita [1]	1,358	6	64	28.55	29.94	−.02	80.9	+1.5	101	23	92	62	1	70	30	66	65	6.51	+3.1	6	11.4	s.	40	n.	13	16	13	2	4.0	.0	.0	7
Oklahoma City [2]	1,214	10	47	28.68	29.93	−.03	85.0	+4.4	106	24	96	66	1	74	29	64	56	.31	−2.6	3	7.7	s.	17	s.	16	15	13	3	3.9	.0	.0	2
Tulsa	674	10	61	29.24	29.93	.....	84.5	+3.4	105	23	96	61	1	73	30	66	60	.26	−3.0	1	9.1	s.	29	se.	27	14	15	2	4.2	.0	.0	2
Southern Slope							82.4	+1.2									60	2.51	+0.1										4.5			
Abilene [2]	1,738	10	56	28.16	29.89	−.04	86.0	+3.2	107	23	98	69	10	74	34	63	56	.22	−1.9	3	9.0	s.	23	n.	26	13	14	4	4.3	.0	.0	2
Amarillo [2]	3,676	10	49	26.32	29.93	+.01	78.2	+1.4	99	24	91	58	8	66	33	61	64	6.64	+3.8	11	11.9	s.	42	s.	7	12	14	5	4.6	.0	.0	15
Del Rio	960	63	71	28.92	29.87	−.03	86.8	+.5	104	26	98	68	11	76	29	67	59	2.51	+.1	2	9.7	e.	27	ne.	9	11	14	6	4.7	.0	.0	5
Roswell	3,566	75	85	26.40	29.91	−.03	78.8	−.1	102	29	92	62	21	65	36	59	60	.68	−1.6	4	7.0	s.	29	n.	24	13	12	6	4.3	.0	.0	11
Southern Plateau							84.5	+1.5									38	0.58	−0.6										4.2			
El Paso [1]	3,778	82	101	26.18	29.84	t.00	80.7	+1.0	101	29	93	61	11	68	33	57	50	.92	−1.1	12	8.7	se.	36	nw.	9	4	15	12	6.1	.0	.0	15
Albuquerque [1]	5,314	5	45	24.82	29.85	.....	79.0	+2.3	100	29	92	60	22	66	34	50	44	1.19	−.2	6	9.1	se.	46	s.	19	11	19	1	4.3	.0	.0	14
Phoenix [2]	1,107	39	87	28.67	29.76	−.02	92.0	+2.2	115	25	105	68	4	78	36	52	32	.25	−.8	3	6.0	w.	30	e.	31	15	11	5	3.9	.0	.0	6
Tucson [1]	2,555	5	23	27.30	29.80	.....	88.0	.....	109	30	102	67	4	74	35	54	38	1.09	−1.2	8	.....	se.	.....	.....	.....	6	13	12	5.8	.0	.0	9
Yuma	142	9	54	29.64	29.75	−.01	92.3	+1.5	120	25	109	67	4	76	40	54	34	T	−.2	0	5.8	sw.	22	se.	30	28	3	0	1.0	.0	.0	1
Independence	3,957	5	26	25.97	29.92	+.09	78.4	+.3	102	26	94	53	1	63	36	41	30	.04	−.1	1	.....	se.	.....	.....	.....	27	4	0	.....	.0	.0	2
Middle Plateau							74.1	+1.3									36	0.25	−0.4										3.1			
Reno [2]	4,526	61	76	25.51	29.95	+.08	70.4	+.3	103	29	92	42	4	49	51	42	50	.60	−.4	1	6.7	nw.	34	s.	20	22	7	2	2.1	.0	.0	5
Tonopah	6,090	9	20	24.13	29.90	.....	73.8	+.2	96	27	86	47	2	61	35	30	22	.04	−.3	2	.....	se.	.....	.....	.....	19	11	1	.....	.0	.0	3
Winnemucca	4,339	5	56	25.65	29.90	.00	73.7	+3.1	102	30	92	47	13	56	47	38	33	.03	−.2	2	7.5	sw.	29	s.	22	21	7	3	2.4	.0	.0	0
Modena	5,473	10	46	24.68	29.89	+.03	70.8	+.2	97	26	89	39	2	53	44	.....	.....	.57	−.5	7	10.2	sw.	37	w.	14	19	7	5	3.4	.0	.0	8
Salt Lake City [1]	4,227	32	46	25.64	29.90	.00	76.0	+2.0	102	26	92	47	13	60	41	46	41	.15	−.4	2	8.7	se.	41	w.	15	19	6	6	3.5	.0	.0	7
Grand Junction	4,602	60	68	25.41	29.91	+.02	79.9	+2.2	100	10	94	55	3	66	36	43	33	.09	−.5	2	6.6	se.	26	nw.	8	15	14	2	3.9	.0	.0	8
Northern Plateau							71.8	+1.4									47	0.30	−0.2										2.9			
Baker [2]	3,471	36	54	26.50	30.01	+.06	66.8	+1.2	97	30	84	39	11	50	49	46	61	.47	−.1	4	5.9	n.	24	sw.	6	22	7	2	2.5	.0	.0	7
Boise [1]	2,739	5	49	27.15	29.91	+.02	73.2	+.7	102	25	89	45	12	58	40	44	40	.16	−.1	1	9.3	nw.	42	sw.	3	22	5	4	2.7	.0	.0	2
Pocatello [1]	4,478	5	31	25.52	29.92	.00	71.2	+1.0	100	26	88	38	13	54	48	40	41	.51	−.3	4	9.8	sw.	38	sw.	31	18	11	2	3.4	.0	.0	9
Spokane [1]	1,929	27	42	27.97	29.97	+.01	69.3	+.3	95	25	84	44	11	54	40	47	52	.35	−.3	3	7.4	sw.	29	n.	14	16	11	4	3.7	.0	.0	1
Walla Walla	991	57	65	28.93	29.96	−.01	75.7	+1.7	101	30	89	49	12	62	39	.....	.....	.21	−.2	3	6.1	s.	21	sw.	8	24	5	2	1.9	.0	.0	1
Yakima	1,076	58	67	28.84	29.98	.....	74.9	+3.5	100	24	89	49	4	61	36	46	41	.07	−.2	1	7.4	nw.	23	sw.	3	22	4	5	3.2	.0	.0	1
North Pacific Coast Region							63.9	0.0									72	0.74	0.0										5.1			
North Head	211	5	56	29.91	30.12	+.04	56.4	−.8	67	7	60	50	24	53	12	53	88	1.11	+.2	13	14.9	n.	33	n.	29	0	7	24	8.4	.0	.0	0
Seattle [2]	125	90	321	29.96	30.09	+.05	64.3	−1.2	84	20	74	49	12	55	28	52	68	.36	−.3	3	7.8	w.	29	s.	10	13	5	13	5.0	.0	.0	0
Tacoma	194	172	201	29.89	30.08	+.02	63.8	+1.0	85	21	73	46	12	54	28	.....	.....	.74	+.1	4	7.6	n.	28	sw.	10	13	11	7	4.5	.0	.0	0
Tatoosh Island	86	9	61	30.04	30.13	+.08	54.4	−.7	62	7	58	49	25	51	11	51	91	2.06	+.5	10	9.9	sw.	29	sw.	3	0	5	26	8.9	.0	.0	3
Medford [1]	1,329	29	58	28.62	29.99	.....	72.4	−.3	101	20	89	46	12	55	47	48	51	T	−.3	0	.....	nw.	.....	.....	.....	23	6	2	2.2	.0	.0	0
Portland, Oreg. [2]	154	68	106	29.92	30.07	+.02	67.8	+1.1	91	24	78	51	12	58	31	55	69	.59	.0	3	6.1	nw.	18	nw.	18	15	13	3	3.7	.0	.0	1
Roseburg	510	45	76	29.53	30.06	+.03	68.4	+1.0	96	20	83	48	12	54	40	52	62	.33	.0	3	5.1	n.	16	n.	28	18	9	4	2.9	.0	.0	0
Middle Pacific Coast Region							68.4	+1.2									63	0.01	0.0										3.7			
Eureka	60	72	88	30.04	30.10	+.05	56.8	+1.3	70	8	61	49	13	53	17	52	86	.04	−.1	4	7.7	n.	32	n.	11	8	5	18	6.8	.0	.0	1
Redding [1]	722	20	34	29.16	29.91	.....	82.4	+.6	107	29	96	59	15	69	36	45	32	T	−.1	0	8.3	nw.	23	n.	12	23	7	1	1.8	.0	.0	2
Sacramento [2]	66	92	115	29.84	29.90	+.02	75.4	+2.2	106	28	92	52	16	59	42	52	53	T	.0	0	7.7	s.	17	s.	15	29	2	0	1.0	.0	.0	1
San Francisco	155	112	132	29.83	29.98	+.03	59.0	+.5	74	27	64	50	31	54	19	52	80	T	.0	0	10.8	w.	26	w.	31	8	15	8	5.1	.0	.0	0
South Pacific Coast Region							73.6	+0.2									61	T	0.0										2.8			
Fresno [1]	327	5	35	29.55	29.87	+.04	81.0	−.3	107	30	98	56	1	64	38	49	40	.00	.0	0	7.5	nw.	18	nw.	8	27	4	0	1.1	.0	.0	0
Los Angeles	338	223	250	29.60	29.94	+.04	70.7	+.5	96	27	81	56	1	60	29	57	68	T	.0	0	5.7	w.	17	w.	26	19	12	0	3.1	.0	.0	0
San Diego [1]	87	20	55	29.86	29.94	+.02	69.0	+.5	85	26	76	57	9	62	25	59	74	.00	.0	0	7.2	w.	17	w.	21	12	16	3	4.3	.0	.0	0
West Indies																																
San Juan, P. R.	82	10	54	29.96	30.06	.....	79.6	−.5	88	6	84	73	24	76	13	74	80	3.81	−2.1	21	13.1	e.	27	e.	1	2	19	10	6.4	.0	.0	6
Panama Canal																																
Balboa Heights	118	6	92	.....	[3]29.84	+.01	80.6	+.3	91	24	88	69	15	74	16	....	[3]85	6.49	−.7	16	6.3	nw.	32	se.	25	1	22	8	6.7	.0	.0	7
Cristobal	27	47	97	.....	[3]29.86	+.01	81.2	+.8	90	19	85	72	15	77	13	75	[3]85	10.44	−5.1	24	8.6	n.	27	se.	15	0	6	25	8.5	.0	.0	10
Alaska																																
Nome	22	25	56	.....	29.79	.....	48.4	−1.5	62	2	53	35	5	44	....	....	89	3.43	+.9	15	9.5	w.	28	sw.	27	3	9	19	.....	.0	.0	0
Fairbanks	455	4	82	.....	29.83	.....	59.4	−.6	85	6	72	34	28	46	....	48	68	.68	−1.2	5	6.3	e.	24	e.	8	0	10	21	.....	.0	.0	3
Juneau [1]	80	96	116	.....	30.04	.....	53.4	−3.3	68	7	59	44	14	48	....	48	85	6.65	+1.5	23	7.9	e.	20	e.	15	0	2	29	.....	.0	.0	0
Anchorage	135	36	47	.....	29.89	.....	55.9	−1.1	74	14	64	40	23	47	....	48	73	2.54	+.9	15	5.0	nw.	24	s.	16	2	6	23	.....	.0	.0	0
Hawaiian Islands																																
Honolulu	38	86	100	29.98	30.01	.....	78.6	+.9	85	27	83	72	1	75	12	....	....	.25	−.9	8	10.3	ne.	26	ne.	6	10	17	4	4.5	.0	.0	0

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken hourly.
[4] Wind, clear, partly cloudy and cloudy data from city office records; other data from airport.
[5] Temperature, pressure (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.

NOTE.—Except as indicated by notes 1, 2, 4, and 5 data in table are city office records.

SEVERE LOCAL STORMS, JULY 1943

(Compiled by Mary O. Souder)

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Gallatin County, Mont.	1	7 p. m.	[1] 2			Heavy hail	Severe damage to peas, alfalfa, and barley; path 5 miles long.
Chouteau County, Mont.	3	P. m.	[1] 3		$5,000	Hail	Light to moderate damage to crops; path 6 miles long.
Cullison, Kans., 3 miles west.	4	3:45 p. m., central war time.	[1] 2½		1,800	Heavy hail	Loss in crops; path 10 miles long.
Hot Springs, S. Dak., vicinity of.	4	5-5:30 p. m.			9,000	do	Loss in spring wheat, oats, and rye; some stock killed; path narrow.
Sutherland, Iowa	4	6:30 p. m.	220	0	15,000	Tornado and hail	A funnel cloud traveled from northwest to southeast. The storm track continued into Buena Vista County as described below.
Clay and Buena Vista Counties, Iowa.	4	7:30 p. m.	[1] 1-5		175,000	Rain, wind, and flood.	This track of destruction is probably a continuation of the Sutherland tornado. Loss in crops, and property damaged.
Pocahontas County, Iowa	4	8-8:30 p. m.	[1] 2-4	0	75,000	Tornado and hail	Crop loss 5 to 25 percent; property damaged.
Calhoun and Webster Counties, Iowa.	4	8:40 p. m.	[1] 3		175,000	Wind, hail, and rain.	Property damaged; path 10 miles long.
Roswell, S. Dak., and vicinity.	4	9:30 a. m.	[1] 2	0	40,000	Heavy hail	Hail, size of hazel nuts, extending from 1 mile west of Roswell for 30 miles to east of county line; poultry killed and crops destroyed with worst damage in 9 mile strip.
Pike County, Ind.	5	3 p. m.	880		500	Wind	Buildings and trees damaged.
Nemaha County, Nebr.	5	3:15-4 a. m.	[1] 20		150,000	Straight-line wind	Property damage and loss in livestock, $50,000; crop loss, $100,000.
Cass County, Ind.	5	5 p. m.	[1] 5		25,000	Wind	Trees, poles, and wires down.
Bethlehem Center, N. Y.	5				20,000	Thunderstorm	2 barns and contents burned.
Judson, Ind.	6	2 p. m.	50	0	600	Tornado	Funnel cloud observed; path from northwest to southeast.
Denver, Colo.	6	6:30 p. m.			50,000	Thunderstorm	Lines and transformers disrupted; property damaged; 4 persons injured.
Halifax, Va.	6	P. m.	[1] 2		3,000	Hail	Loss in crops, chiefly tobacco; path 4 miles long.
Oglala, S. Dak., vicinity of.	7	4-4:30 p. m.	[1] 3		4,000	do	Loss in crops; path 6 miles long.
Hill City to Custer, S. Dak.	7		[1] 2		4,500	Heavy hail	Property damaged, $1,500; loss in crops, $3,000.
Prairie and Dawson Counties, Mont.	8	5-8 p. m.	[1] 10		200,000	do	Loss in crops.
Houston, Tex.	8	7:30 p. m.		1		Tornado	Considerable property damage; no crop loss.
Richland County, Mont.	8	9 p. m.			200,000	Hail	Estimated 25 percent of crops in county touched by hail.
Tula, Tex.	8	P. m.	[1] 5-10			do	Hundreds of thousands of dollars total damage; 175 sheep and 450 chickens killed.
McCone County, Mont.	9	7 p. m.	[1] 2		30,000	Heavy hail	Loss in crops; path 5 miles long.
Fergus County, Mont.	10	4 p. m.	440		2,000	Hail	Do.
Prairie to Dawson Counties, Mont.	10-11	11 p. m.-2 a. m.	[1] 2		20,000	Moderate to heavy hail.	Crop loss $20,000; considerable property damaged, not estimated.
McCone County, Mont.	11	3 a. m.			5,000	Wind	Property damaged.
Wibaux County, Mont.	11-12	11:30 p. m.-1 a. m.	[1] 2½		3,500	Hail	Loss in wheat and flax; path 40 miles long.
Prairie to Dawson Counties, Mont.	12	Midnight-2 a. m.	[1] 2-40		150,000	Wind and hail	Severe crop loss and considerable property damage; path from 15 to 40 miles long.
Morrill County, Nebr., western portion.	12	7 p. m.	[1] 4-8		400,000	Heavy hail	Loss in crops; roads and bridges washed out. Storm struck mostly irrigated and very productive farming area.
York County, Pa.	12	P. m.			5,000	Electrical	Damage to property; loss in crops.
Minnesota, extreme northern counties.	13	12 p. m.-2:40 a. m.	[1] 50		470,000	Thundersqualls	Property damaged; some livestock and much poultry killed; loss in growing crops not estimated; path 200 miles long.
Carlisle, Pa.	14	9 p. m.			8,000	Electrical	Barn burned.
Ravalli, Mont.	15	1 a. m.	880		500	Moderate hail	Damage to seed peas.
Critz to Martinsville, Va.	15	4 p. m.	[1] 2		5,000	Thundersquall	Corn flattened; chief loss in tobacco; path 15 miles long.
Lake Byron, S. Dak., and vicinity.	15	5-5:40 p. m.	4-6			Heavy hail	Spotted damage to crops, especially small grain; some fields complete loss; path 12 miles long.
Edmond, Kans., 1 mile northwest.	15	7-7:30 p. m.	34		1,000	Wind	Although a vortex cloud was not observed during this storm, tornadic characteristics were visible. Buildings on a farm were badly damaged; path 880 yards long.
America Fork, Utah, vicinity of.	15				30,000	Wind, rain, and hail.	10,000 turkeys valued at $30,000 lost; some loss in raspberries; damage to grain quite extensive; some flood damage in vicinity of Pleasant Grove.
Sherman and Thomas Counties, Kans.	16	8-9 p. m.			75,000	Hail and wind	Storm occurred in eastern Sherman and western Thomas Counties. One branch of the storm struck in northeastern another in southwestern Thomas County. Chief loss to crops from hail and considerable damage to rural property by wind; path 25 miles long.
Ness County, Kans.	17	12:30-2:30 a. m.	[1] 4			do	Hail extended over a path about 4 miles wide and 28 miles long, from Utica to near Bazine, Kans., with loss in crops and damage to property. Considerable damage from wind in Ness City; not estimated.
Fallon County, Mont.	17		[1] 3		7,500	Hail	Loss in crops; path 25 miles long.
Charlottesville, Va., vicinity of.	17			1	10,000	Wind, rain electrical.	Dairy barn blown down killing a woman while milking; loss in livestock; damage to property.
Pipestone, Lyon, Redwood, and Faribault Counties, Minn.	18	1:40 p. m.		0	1,615,000	Possible tornado, hail, and heavy rain.	Barns and buildings damaged; and airport hangar wrecked; poles and wires down; trees uprooted. Loss in growing crops from hail, $1,325,000; property damaged from wind, $97,500; from hail, $290,000.
Cherokee County, Iowa.	18	7:30 p. m.	[1] 2-5		500,000	Hail, wind, and rain.	Loss in corn, oats, and soybeans; some areas total loss; soil washed by heavy rains.
Fremont County, Iowa.	19	1 a. m.	[1] 2-6		100,000	Hail, rain, and wind.	Loss in corn crop; property damaged; path 10 miles long.
Sioux, Plymouth, Woodbury, and Cherokee Counties, Iowa.	20	10 a. m.			25,000	Wind, electrical	Property damaged; trees uprooted; communication and power lines damaged; 2 persons injured.
Calhoun County, Iowa.	20	4-7 p. m.			25,000	Hail	Loss in crops; path several miles wide and from 8 to 12 miles long.
Bay Springs, Miss., vicinity of.	20	5:30 p. m.			700	Wind	Barn blown down.
Berks County, Pa.	20	P. m.			40,000	Electrical	2 barns burned.
Critz to Penn's Store, Va.	20	do	[1] 10		2,500	Hail	Loss in crops, mostly tobacco; path 10 miles long.
Kosciusko County, Ind.	21	6:30 p. m.	[1] 2	6	2,000	Wind	6 persons drowned when boat sank.
Denver, Colo. and vicinity.	21	7:20 p. m.		1	7,000	Electrical and hail	Houses burned; farms and gardens in the vicinity of Denver damaged by hail but none reported at station.
Marion, Ind.	21	9 p. m.			500	Wind	Property damaged.
Allen County, Ind.	21	P. m.			1,000,000	Wind and hail	Loss in crops, $900,000; property damage, $100,000. This storm extended into Ohio.
Fernley, Nevada	21				39,000	Hail	Chief loss in crops; some property damage.
Johnstown, Pa., vicinity of.	22	A. m.			12,000	Electrical	Utility services disrupted; barn burned.
Lee County, S. C.	23	do			10,000	Hail	Loss in crops.
Pottawattamie County, Iowa.	23	11 p. m.			25,000	Wind and hail	Crop loss from hail in a few cases over 90 percent; wind damage to buildings $500.
Roscoe, S. Dak., and vicinity.	23-24	Midnight	[1] 3		5,500	Heavy hail and high wind.	Loss in crops, $4,000; barn wrecked, $1,500; path 4 miles long.
Cass County, Iowa.	24	12:30 a. m.		0	20,000	Tornado and hail.	Trees, telephone, power lines, and buildings on at least 6 farms damaged. Loss in crops spotted and heaviest southeast of Wiota, where hail fell in scattered areas.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, JULY 1943—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Emmet County, Iowa	24	5 a. m.			5,000	Wind and hail	Electric service interrupted; some uncut oats flattened with loss in other crops.
Adair County, Iowa	24	A. m.			5,000	do	Scattered loss in crops.
Fargo, Okla.	24			0		Light tornado	No damage.
Mount Crawford and Elkton, Va.	25	P. m.			1,000	Thunderstorm	Property damaged; corn flattened.
Lawrence County, Kans.	26	3 a. m.	880		500	Wind	Trees and poles down.
Brainerd, Minn., and vicinity	26	7 a. m.			1,000	Thundersquall	Farm buildings damaged; haystacks scattered; poles and wires down; tree uprooted: loss in growing crops.
Waynesburg, Pa.	26	A. m.			1,000	Electrical and rain	House burned; streets flooded.
Hutchinson and Turner Counties, S. Dak.	26	7:30–8 p. m.	[1] 3–4		19,550	Wind, rain and hail	Total loss in corn and grain in places: barns, windmills, and dwellings wrecked; some chickens, sheep, and cattle killed.
Sulphur Springs, Tex.	26	7:45 p. m.	[1] 1		15,000–20,000	Wind and hail	Loss to crops from hail, $15,000 to $20,000; damage from wind light.
Houston, Tex., and vicinity	26–29				15,000,000	Tropical disturbance	Comparatively little actual damage occurred within the city limits. Several defense plants in outlying areas suffered heavy damage to temporary buildings and scaffolding, but the largest loss to such plants was loss of time and production due to lack of power. Overhead utility lines suffered heavily and many sections of the area were without power, light, and telephone service for several days. Loss in crops from high winds and later damage from excessive rains. Small and experienced growers insist that the good resulting from the generous rains far outweighed the damage suffered from the storm. Chief crop loss, a considerable acreage of early rice being ready for harvest. Immediately following the passage of the storm, 12.19 inches of rain fell in Houston.
Jackson, Minn., and vicinity	27	5 a. m.	[1] 4		50,000	Thunderstorm and hail.	Loss in growing crops; path about 16 miles long.
Clearfield, Pa.	27	P. m.		1	12,000	Electrical	Utilities disrupted; several fires reported.
Custer County, Mont.	27		[1] 3		1,500	Hail	Path 5 miles long; no details.
Iowa and Washington Counties, Iowa.	28	10:30 a. m.			20,000	Wind	10 percent loss in crops over an area several miles long and from 440 to 880 yards wide.
Vigo County, Ind.	28	3:30 p. m.			5,000	do	Poles and wires down; windows damaged.
Montgomery, Ind.	28	4 p. m.	[1] 2		10,000	Wind and hail	Property damage, $500; loss in crops, $10,000.
Jackson County, Ind.	28	5 p. m.	[1] 10		11,500	do	Trees, poles, wires and windows damaged; crop loss, mostly corn, $7,500; property damage $4,000.
McCook and Minnehaha Counties, S. Dak.	28	8 p. m.	[1] 2		10,000	High wind, heavy rain and hail.	Buildings wrecked; crops stripped and poultry killed.
Carroll County, Iowa	28	9:30 p. m.	[1] 3	0	150,000	Tornadic wind and hail.	Property damage, $50,000; loss in crops, $100,000.
Guthrie and Dallas Counties, Iowa.	28	10:30 p. m.	[1] 2½		10,000	Wind and hail	Crop loss from 5 to 50 percent.
Jasper County, Iowa	28	11 p. m.	[1] 3		100,000	do	Damage from hail, $75,000; from wind, $25,000.
Moravia, Iowa	28	do			1,500	do	Hatchery unroofed: trees and wires down.
Indianola, Iowa, and vicinities	28	11:15 p. m.			18,000	do	Property damage, $13,000; loss in crops, $5,000; path about 18 miles long.
Hutchinson County, S. Dak. extreme eastern portion.	28				1,750	Wind, rain, and hail.	2 granaries destroyed and loss in some crops.
Poweshiek County, Iowa, southern portion.	28–29				50,000	Wind and hail	Several small barns wrecked and many smaller buildings destroyed or damaged.
Washington County, Iowa	29	1 a. m.			50,000	Hail	No details.
Scott County, Ind.	29	2 a. m.	[1] 2		1,000	Wind	Property damage; heavy loss in crops.
Keokuk County, Iowa	29	3 a. m.			95,000	Wind and hail	Loss in crops, $85,000; property damage, $10,000.
Oil City, Pa.	29	5:30 p. m.	[1] About ½ mile	0	45,000	Tornado	Buildings demolished; trees twisted off; wires down; 2 persons injured; path 3 miles long.
Charleston, Ind.	29	7 p. m.	67	0	800,000	do	7 persons injured; path from west to east and 7 miles long.
Jay County, Ind.	29				1,000	Wind and hail	Barns damaged.
Madison County, Ind.	29				500	Wind	Poles, wires, and trees down.
Eaton Rapids, Mich., vicinity of.	29		2,200		22,000	Wind, hail, electrical.	Crop loss, $20,000; property damage, $2,000; path 10 miles long.
Elmont, N. Y.	29				2,000	Electrical	Pumping station damaged.
Brown & Doniphan Counties, Kans.	30	2 a. m.	[1] 3		150,000	Heavy hail	Chief loss in corn; path 20 miles long.
Columbia, Pa.	30	A. m.			1,000	Electrical and Wind	Trees blown down; Property damage.
Glenwood Springs, Colo.	30	4:45–6:30p.m.	2,200		7,000	Hail	Considerable damage to crops and railroad property. More than 2,000 chickens drowned.
Boone and Story Counties, Iowa.	31	4:30 a. m.	[1] 5		600,000	Hail, wind, electrical, and flood.	Windows broken; property damaged; loss in crops on 8,000 acres of land. Several barns burned. 3.29 inches of rain fell in Boone, Iowa, and 3.58 inches recorded in Ames, Iowa. Path 20 miles long.
Marshall and Jasper Counties, Iowa.	31	7:30–9:30a.m.			50,000	Wind, electrical, and flood.	From 1.85 to 4.23 inches of rain recorded. All small streams overflowed with highest water in Marshall County and many acres of cropland flooded. Much livestock drowned, one farm losing 23 sheep, another 20 hogs. Considerable damage to roads and highways; basements partially flooded.
Wadena, Minn., vicinity of	31	7:05 p. m.	100	0		Tornado	A funnel cloud observed in the west-southwest, moving east-northeast, dipping to earth several times before it disappeared.
Pope, Douglas, Kandiyohi, and Redwood Counties, Minn.	31	8–11:45 p. m.		0	1,020,000	Tornado and hail	Property damage, $120,000; hail loss to growing crops, $900,000; path 110 miles long.
Mahnomen, Minn., and vicinity.	31			0	60,000	do	Funnel cloud observed. Damage to property, $25,000; loss to growing crops from hail, $25,000.

[1] Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR JULY 1943

[Solar Radiation Investigations Section, I. F. HAND in charge]

SOLAR RADIATION OBSERVATIONS

Explanations of the tables and references to descriptions of instruments, stations, and methods of observation, and to summaries of data, are given in the January 1942 REVIEW, page 20; a list of pyrheliometric stations is also given in the REVIEW for January 1943, page 12.

TABLE 1.—*Solar radiation intensities during July 1943*

[Gram-calories per minute per square centimeter of normal surface]

Madison, Wis.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.				P. M.					Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
July 2	12.7	0.58	0.64	0.80	1.01	1.24					13.2
July 6	20.4	.44	.55	.70	.90	1.21					20.4
July 8	17.6	.42	.55	.65	.79	1.16					20.4
July 9	21.1		.50	.64	.77	.97					19.0
July 14	20.4				1.22	1.41	1.19				15.3
July 15	16.5	.83	.92	1.03	1.14	1.37					13.2
July 17	24.2										16.5
July 19	19.6	.64	.79	.94	1.07	1.33					19.0
July 20	20.4	.69	.79	.90	1.10	1.41					18.3
July 21	21.8										20.4
July 22	14.8		.84	.96	1.13						17.0
July 26	23.4	.58	.69	.83	.99	1.09					24.2
July 29	17.7				1.10	1.38	1.13				17.7
Means		.60	.70	.83	1.02	1.26	(1.16)				
Departures		−.04	−.05	−.05	−.03	−.03	+.17				

Albuquerque, N. Mex.

July 1	15.9					1.40	1.05	0.86	0.73	0.64	9.8
July 3	10.5		0.95	1.04	1.19	1.50	1.30	1.15	1.04	.97	5.4
July 4	10.8						1.30	1.17	1.06	1.00	5.8
July 5	8.5	0.91	.97	1.09	1.22						9.1
July 7	13.6								.83	.74	11.5
July 8	12.9			.92	1.06	1.45					15.2
July 9	14.2			.96	1.13	1.45					9.8
July 10	13.6			.97	1.14	1.44		.99	.89		9.1
July 11	10.5	.73	.82	.89							9.1
July 12	10.5				1.09	1.41					8.8
July 21	15.2					1.37					16.6

TABLE 1.—*Solar radiation intensities during July 1943*—Continued

[Gram-calories per minute per square centimeter of normal surface]

Albuquerque, N. Mex.—Continued

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.				P. M.					Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
July 22	15.2		.85		1.08						12.9
July 23	14.9			.91		1.43					10.5
July 24	13.2		.63			1.46					11.8
July 26	15.2	.70	.80	.92	1.08						10.5
July 27	11.5		.69								10.2
July 28	11.8	.70	.80	.92							9.8
July 29	11.8			.92							11.5
Means		.76	.81	.95	1.12	1.43	1.22	1.04	.91	.84	
Departures		−.03	−.05	−.03	−.05	+.03	+.03	.00	+.01	+.02	

Lincoln, Nebr.

July 6	17.9					1.35	1.14	0.97	0.86	0.79	16.6
July 11	18.6					1.21	.88	.67	.58	.52	16.6
July 14	16.6					1.43	1.17	1.01	.90		11.5
July 17	20.0						1.19	.99	.86	.77	17.9
July 19	20.6					1.49	1.10	.94	.84	.73	26.0
July 20	26.0					1.34	1.10	.92	.75	.66	26.0
Means						1.36	1.10	.92	.80	.69	
Departures						+.02	+.03	+.03	+.04	+.01	

Blue Hill, Mass.

July 1	10.2	0.77	0.81	0.94	1.16					(0.68)	9.1
July 2	10.2	.65	.76	.88	1.05		0.91				9.1
July 3	13.7							0.84	(0.71)	(0.61)	13.1
July 16	16.5	.58	.78	(0.98)	(1.13)	1.42	1.17	1.00	.90	(0.80)	16.5
July 17	15.4	.84	.95	(1.06)	1.22	1.38					14.8
July 18	25.8							.83	.69	.56	19.0
July 19	16.5	.78	.90	.97	1.16		1.22	1.05	.96	.78	13.2
July 20	13.2	.71	.82	.98	1.11						14.8
July 23	18.5						1.19	.79	.70	.62	18.4
July 24	20.4					1.29					14.8
July 30	18.5							.87	.73	.60	21.8
July 31	19.0		.65	.80	.94						18.4
Means		.72	.81	.94	1.11	1.36	1.12	.90	.78	.66	
Departures		+.10	+.11	+.06	+.06	+.09	+.11	+.05	+.08	.00	

*Extrapolated.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington	Madison	Lincoln	East Lansing	New York	Fairbanks	Nashville	Twin Falls	La Jolla	New Orleans	Riverside	Blue Hill	Newport	State College	Put-in-Bay	East Wareham	Davis Calif.	Fresno
1943	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 2	.....	674	465	708	652	485	325	669	664	459	654	652	748	697	736	631	758	701
July 3	545	348	270	456	473	332	330	397	670	643	632	655	715	667	567	703	793	701
July 4	348	577	618	332	399	576	480	682	684	697	632	444	406	186	274	498	780	718
July 5	466	313	729	629	200	692	525	693	.....	754	646	70	108	583	671	118	782	698
July 6	510	189	769	322	547	664	593	697	532	743	614	640	645	490	534	663	782	691
July 7	144	715	720	572	147	504	646	593	542	602	614	281	102	426	143	133	794	696
July 8	261	667	662	469	328	635	468	701	484	266	645	474	496	148	495	523	792	697
Mean	378	498	605	498	392	555	481	633	596	595	634	459	460	457	488	467	783	700
Departure	−130	−48	+17	.....	−112	+85	−4	+27	+26	+166	+32	−88	−90	−35	−70	−31	.....	+2
July 9	244	574	663	661	252	544	399	720	432	616	636	421	421	235	668	335	774	714
July 10	403	655	694	459	309	628	549	708	601	391	614	618	529	370	222	518	778	686
July 11	464	587	677	301	266	490	404	722	597	313	622	456	656	444	441	593	768	678
July 12	472	578	666	337	328	.....	403	750	546	410	630	511	594	485	451	576	758	674
July 13	472	630	478	504	302	.....	516	728	608	683	515	333	314	459	585	284	745	634
July 14	596	739	736	480	333	528	465	616	541	534	542	425	400	516	480	404	742	647
July 15	637	683	642	666	528	551	572	703	584	659	454	518	510	679	707	474	762	672
Mean	470	635	651	487	331	548	473	707	558	515	573	469	489	456	508	455	761	672
Departure	−34	+88	+63	.....	−161	+64	+1	+89	−53	+88	−8	−42	−37	−75	−40	−22	.....	−14
July 16	693	159	537	478	675	455	601	711	662	490	622	713	734	686	597	695	757	689
July 17	511	659	662	431	576	441	614	683	510	435	590	639	684	370	398	674	715	670
July 18	446	703	559	673	548	462	412	685	565	481	495	566	461	650	726	433	718	667
July 19	676	705	616	571	694	491	531	426	459	531	580	692	722	714	667	670	744	664
July 20	580	659	668	577	479	434	560	511	640	570	589	584	701	543	644	648	687	656
July 21	596	673	672	497	453	255	666	356	654	582	625	582	660	564	529	638	730	681
July 22	593	508	681	440	294	591	577	613	664	639	618	306	255	473	360	228	719	705
Mean	580	581	628	524	531	447	566	569	593	532	588	583	602	571	560	570	724	676
Departure	+93	+48	+55	.....	+57	+12	+86	−50	+20	+107	+19	+88	+103	+31	+23	+108	.....	−3
July 23	698	484	704	620	633	518	731	629	686	679	604	374	330	691	667	308	725	689
July 24	624	368	691	458	571	540	669	605	555	599	617	652	648	603	461	608	686	706
July 25	442	635	394	354	409	346	404	442	610	548	606	405	428	380	421	426	733	713
July 26	419	519	646	560	377	468	117	620	557	165	584	402	484	518	593	372	726	708
July 27	561	605	668	349	375	220	588	637	491	151	295	553	616	473	338	603	713	672
July 28	482	208	572	445	561	507	589	633	563	552	578	502	568	411	530	560	684	636
July 29	459	694	490	280	203	372	630	667	466	621	583	66	180	226	298	175	694	676
Mean	526	502	586	438	447	424	533	605	561	474	552	422	465	472	473	436	709	685
Departure	+38	−11	+36	.....	−6	+5	+87	+30	+47	+62	+15	−32	−23	−35	−39	−16	.....	+29
ACCUMULATED DEPARTURES ON JULY 29, 1943																		
	+2534	+1057	+3941	.....	−4564	+2093	+1729	+805	−3367	.....	−77	−2534	−658	−3248	−882	+273	.....	.....

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JULY 1943

Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1943	*h m*		°	°	°	°				
July 1	9 30				No spots				G	Mt. Wilson.
2	10 57				No spots				VG	U. S. Naval.
3	11 49				No spots				G	Do.
4	8 47	*	5	193	+37	35	12	1	VG	Mt. Wilson.
				(198)	(+3)		12	1		
5	10 42				No spots				VG	U. S. Naval.
6	10 33				No spots				G	Do.
7	8 54	7589	−81	77	+13	81	242	2	G	Mt. Wilson.
				(158)	(+4)		242	2		
8	8 35	7589	−77	68	+13	77	339	8	F	Do.
		7589	−68	77	+13	68	436	5		
		7590	+10	155	+10	12	12	2		
		(*)	+28	173	+5	28	6	1		
				(145)	(+4)		793	16		

See footnotes at end of table.

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JULY 1943—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1943	*h m*		°	°	°	°				
July 9	13 31	7589	−58	71	+12	58	339	15	G	U. S. Naval.
		7589	−50	79	+13	51	388	5		
		7590	+26	155	+8	27	73	7		
		7591	+70	199	−10	70	12	1		
				(129)	(+4)		812	28		
10	11 59	7589	−47	69	+12	48	412	18	G	Do.
		7589	−36	80	+14	37	339	7		
		7590	+39	155	+8	39	24	4		
				(116)	(+4)		775	29		
11	11 8	7589	−33	71	+12	34	291	19	G	Do.
		7589	−22	82	+14	24	412	10		
		7590	+54	158	+8	54	16	3		
				(104)	(+4)		719	32		
12	11 34	7589	−19	71	+12	21	242	15	F	Do.
		7589	−8	82	+13	12	388	5		
				(90)	(+4)		630	20		
13	12 52	7589	−4	72	+12	9	242	14	G	Do.
		7589	+7	83	+14	13	388	3		
				(76)	(+4)		630	17		
14	10 38	7589	+9	73	+12	12	194	20	VG	Do.
		7589	+19	83	+14	21	364	1		
				(64)	(+4)		558	21		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JULY 1943—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate quality	Observatory
			Difference in longitude	Longitude	Latitude	Distance from center of disk				
1943	h m		°	°	°	°				
July 15	10 37	7589	+21	72	+12	23	97	12	VG	U. S. Naval.
		7589	+31	82	+14	33	364	1		
				(51)	(+4)		461	13		
16	11 38	7589	+35	72	+13	37	73	16	VG	Do.
		7589	+45	82	+14	46	339	1		
				(37)	(+4)		412	17		
17	10 56	7589	+49	73	+13	50	12	5	F	Do.
		7589	+59	83	+14	59	339	1		
				(24)	(+5)		351	6		
18	12 16	7589	+73	83	+14	73	339	1	VG	
				(10)	(+5)		339	1		
19	10 56	7589	+87	85	+14	87	242	1	G	Do.
				(358)	(+5)		242	1		
20	10 39	7592	+30	15	+1	31	12	4	VG	Do.
		7592	+31	16	−1	32	16	1		
				(345)	(+5)		28	5		
21	10 32	7592	+43	15	0	44	36	7	VG	Do.
				(332)	(+5)		36	7		
22	10 49	*	−5	313	+1	6	24	7	G	Do.
		*	+41	359	−11	44	24	2		
		7592	+57	15	0	58	6	2		
				(318)	(+5)		54	11		
23	11 4			No spots					VG	Do.
24	10 46	7595	+13	305	−3	14	48	4	F	Do.
		7594	+21	313	+2	22	12	3		
				(292)	(+5)		60	7		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JULY 1943—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate quality	Observatory
			Difference in longitude	Longitude	Latitude	Distance from center of disk				
1943	h m		°	°	°	°				
July 25	11 35	7595	+27	305	−3	29	73	10	VG	U. S. Naval.
		7595	+30	308	−2	31	24	7		
		7594	+37	315	+2	38	12	2		
				(278)	(+5)		109	19		
26	10 56	7595	+40	305	−3	41	48	3	G	Do.
		7595	+44	309	−2	45	24	2		
				(265)	(+5)		72	5		
27	10 57	7597	−81	171	+8	81	48	2	VG	Do.
		7596	−11	241	−35	41	24	6		
		7595	+53	305	−3	54	73	2		
		7595	+58	310	−2	59	73	9		
				(252)	(+5)		218	19		
28	10 37	7597	−68	171	+8	68	48	1	F	Do.
		7596	+1	240	−36	41	6	1		
		7596	+67	306	−3	68	73	4		
		7595	+71	310	−3	72	61	3		
				(239)	(+5)		188	9		
29	12 18	7597	−55	170	+8	55	61	1	G	
		7595	+84	309	−3	84	48	3		
				(225)	(+6)		109	4		
30	10 59	7597	−52	160	+9	52	6	1	F	Do.
		7597	−41	171	+8	41	61	1		
		7598	+10	222	−6	16	12	2		
				(212)	(+6)		79	4		
31	10 49	7597	−28	171	+8	28	36	4	VG	Do.
				(199)	(+6)		36	4		

Mean daily area for 31 days=257

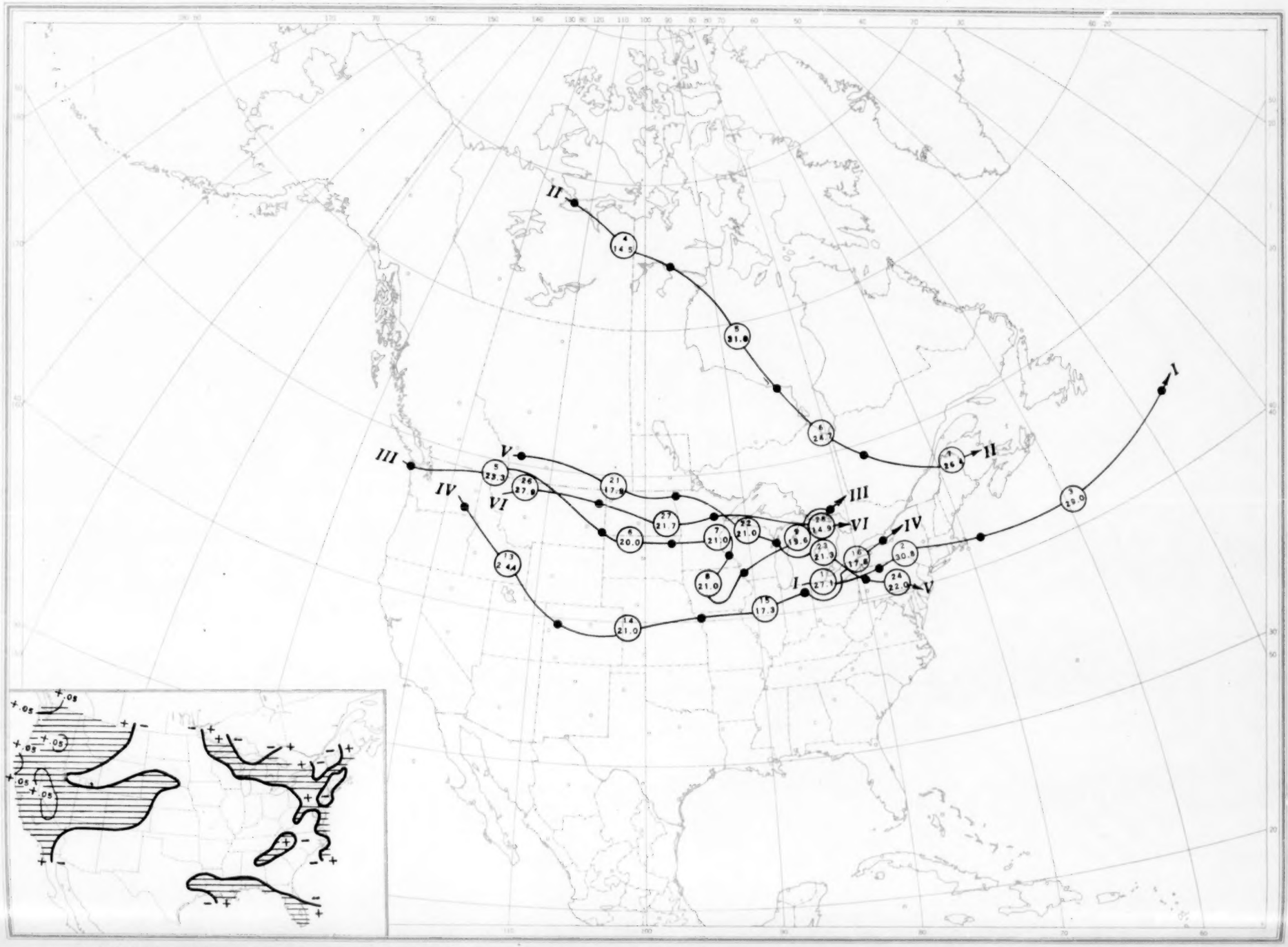
*Not numbered.
VG=very good; G=good; F=fair; P=poor.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, July 1943

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, July 1943

+2°
+4°
100 50 0 50 100
Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency

Chart II. Tracks of Centers of Anticyclones, July 1943. (Inset) Departure of Monthly Mean Pressure from Normal

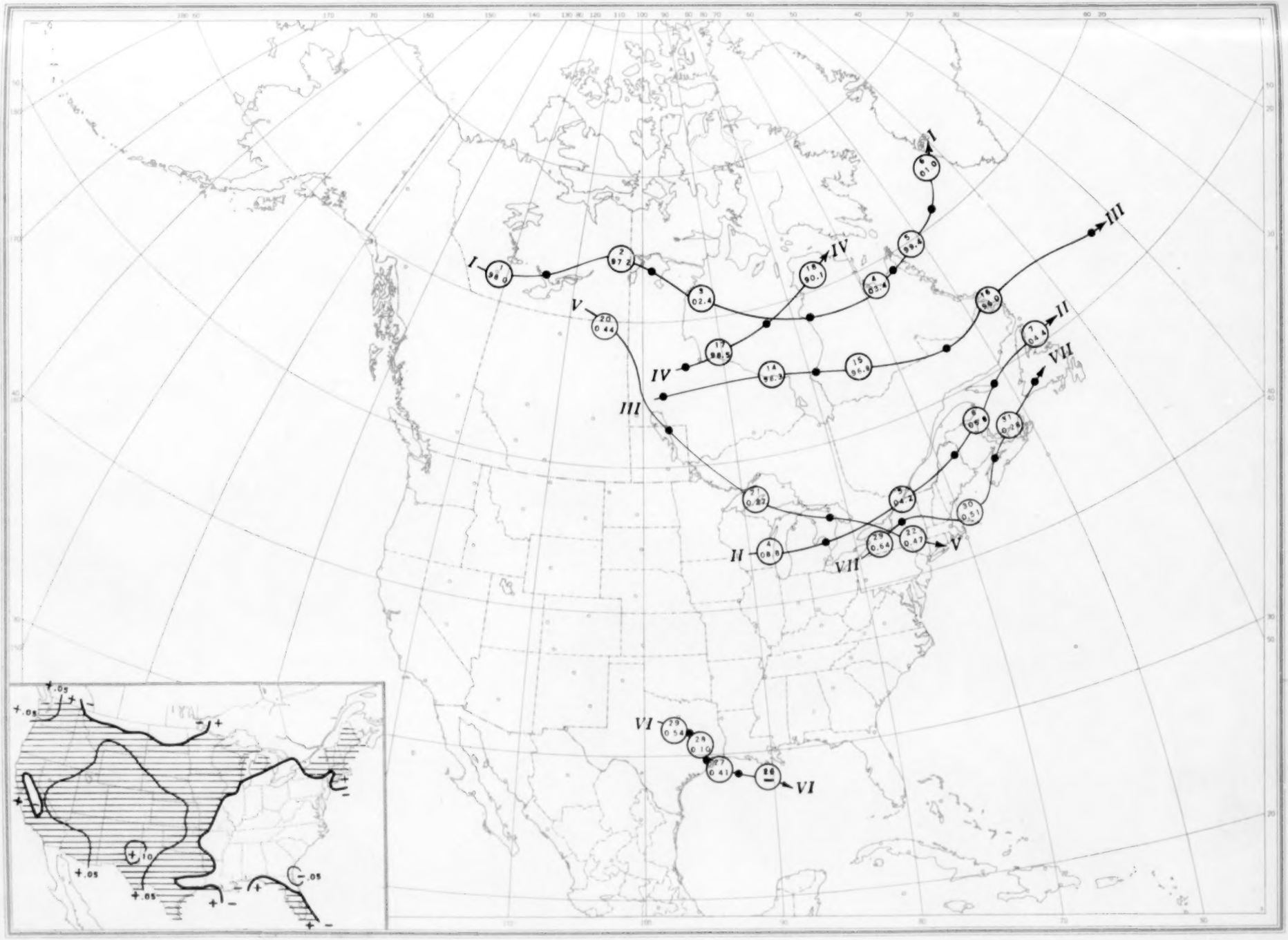


Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

Chart III. Tracks of Centers of Cyclones, July 1943. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

Chart III. Tracks of Centers of Cyclones, July 1943. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, July 1943

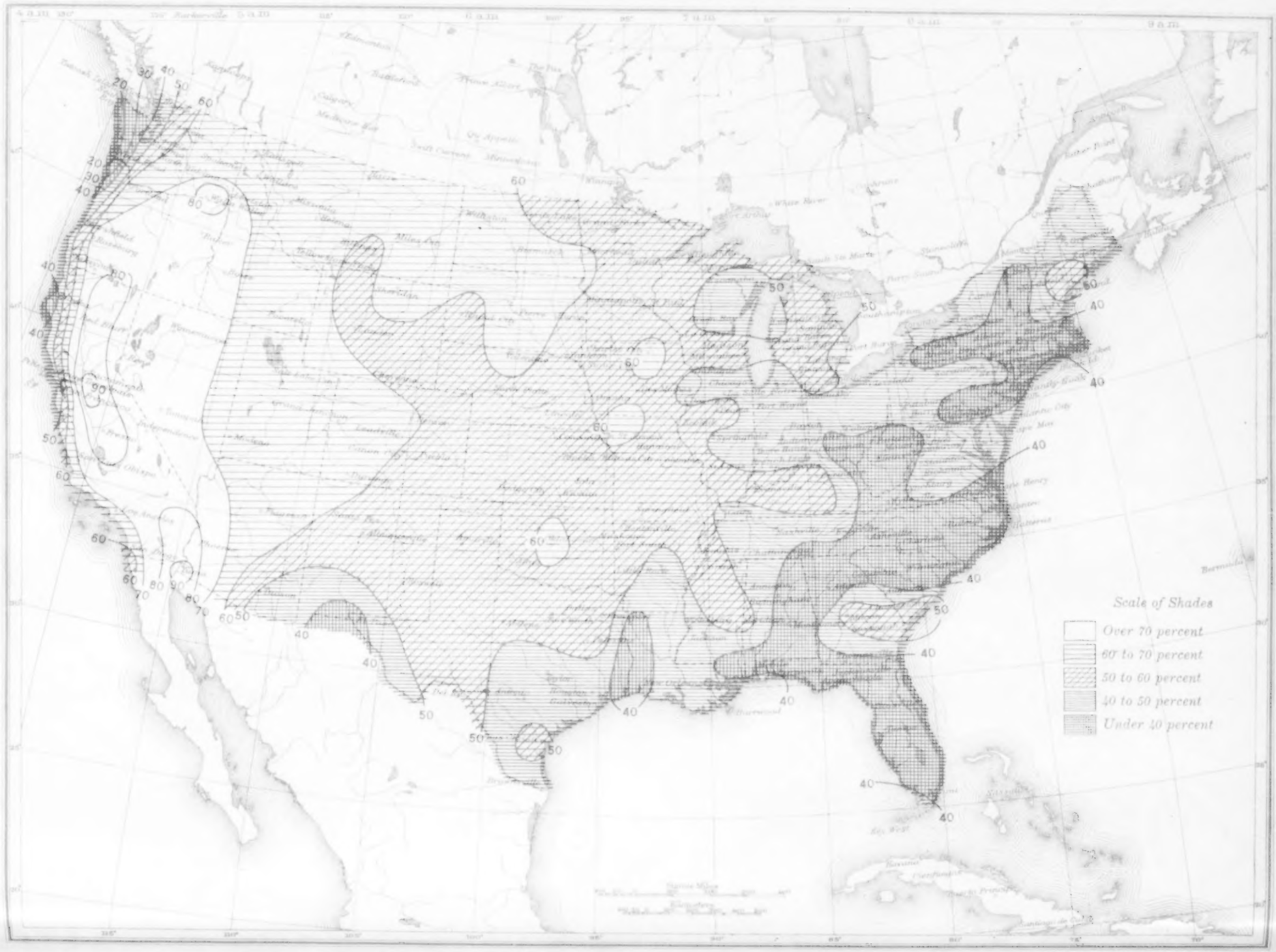


Chart V. Total Precipitation, Inches, July 1943. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, July 1943. (Inset) Departure of Precipitation from Normal

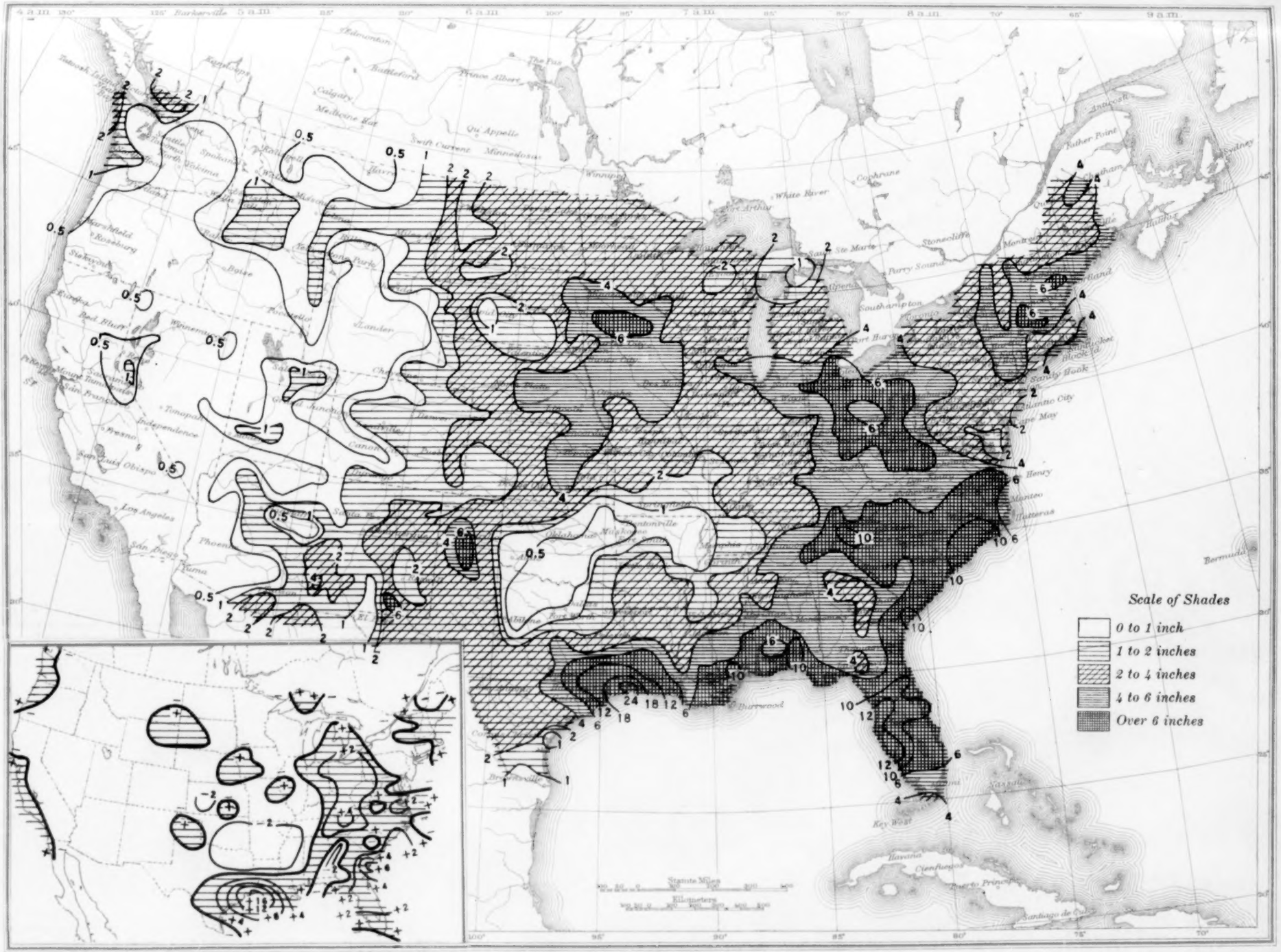
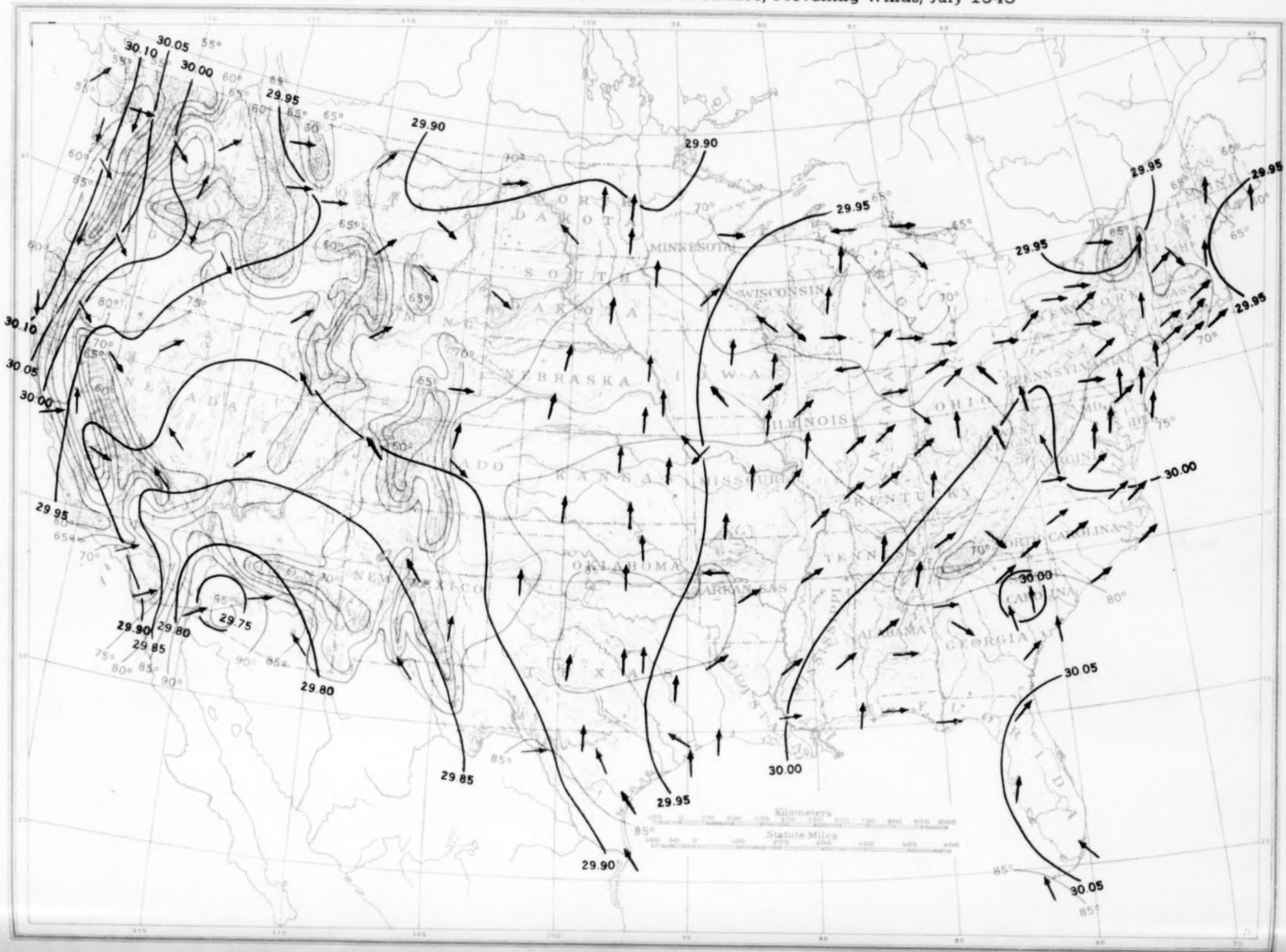



Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, July 1943